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INDEX TO VOLUME XLVII

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ARTICLES MARKED THUS * ARE ILLUSTRATED

PAGE

A

Adaptation of Roads to Omnibuses 264
Admiralty Motor Vehicles 162
Advisory Committee on London Traffic, Report of 200
Albion Chars-a-bancs 164, 281
Albion Factory, New 332
Albions for South Africa 282
Alcohol derived from Coke 49
Alcohol for Fuel 96
Ambulances for Hospitals 338
America, Visit of Transport Man to (C. J. Spencer) 192
American Electric Railways Buying Supplies .. 191
American Public Utilities 319
American Tramway Fare Changes 77
Anglo-Argentine Tramway Fares Increase .. 76
Appointments' Register for Automobile Engineers 203
Army Lorries, Sale of 157
Associated Equipment Company Chars-a-bancs* 340
Omnibuses* 162, 283
Tipping Wagon* 339
Austin Motor Company's Products 102

B

Baghdad-Kadhiman Tramways 256
Bakerloo and Watford Service Trains* ..185, 309
Ballarat, Reduction of Accidents at 255
Bavaria, Super Power Station in 28
Beck Omnibus Cover* 48
Belgian Petrol Company, A New 229
Belgian Railway Electrification 32
Benzol, Rise in Price of 102
Bethlehem Motor Vehicles* 229
Blue Bird 'Bus* 332
Bournemouth Corporation Omnibus Accounts 288
Bradford Return Load Bureau 48
Railless Battery Vehicle 160
Railless Omnibus 81
Tramway Employees' Social Club 26
Bristol Tramways Company 324
British Electrical Federation Offices 33
British Engineering Standards Association Committee 207
British Fare System Invades America 77
British Railway Electrification 85
British Standard Special Track Work 144
British Standard Tires and Rims 283
Buenos Ayres Railway Electrification 32
Business Notices 211

C

Caen Tramway Cars* 249
Car Construction at Shanghai 136
Car Jacks* 86
Central Scotland Omnibus Services* 221
Centre-Entrance Car 192
Challenge Shield, Freedom from Accidents .. 280
Charges (Road) for Omnibus Traffic 99
Chicago Fares Increased 84
Chicago, Milwaukee & St. Paul Railway* .. 301
Chicago Truck Show, Pneumatic Tires at .. 220
Classification of Roads 276
Coaching Developments 337
Coal Conveying Plant at Greenwich 29
Coal Saving by Electrification 304
Commercial Motor Parade 156
Commercial Motor Users' Association, Report of 231
Conductors' Pay 199
Contracts and Orders .. 38, 89, 150, 214, 270, 326
Copenhagen Tramways Require Cars 192
Cost of Track Reconstruction 133
Coupled Cars in America 193

D

Daimler Lorry with Tipping Body* 163
Single Deck Omnibus 283
Dennis Lorries* 49
Touring Coach* 280
Tower Wagon* 159
Dick-Kerr Works at Preston 313
Direct Current Passenger Locomotive (3,000 volts)* 74
Disabled Men as Drivers 209
Disposal Board, Policy of 157
District Railway (London) 29, 70
Improvements in Station Stops 29
Rolling Stock* 71
Running Times compared with Horse Omnibuses 29
Dodson Single-Deck Omnibus* 158
Double-Deck Omnibus, Bradford Railless* .. 81
Liverpool New Motor* 97
Double-Deck Railless Car* 80, 81
Du Cros, W. & G., Commercial Vehicles .. 228
Duff, Barratt Car Jacks* 86
Dundee Tramway Management 146

E

East India Tramway Company's Cars* .. 27
Economic Fare, An 189

Digitized by Google

PAGE

Edinburgh Cable Cars 80
Chars-a-bancs* 103
Omnibuses 80, 162, 232, 257
Omnibus Orders 99
Editorial 30, 82, 138, 194, 258, 314
Advisory Committee on London Traffic .. 83
Automobile Competition 31
Car Economies 84
Decimal Coinage Shelved Again 196
Effective Publicity 139
Electric Power Development 315
Electricity Supply Act 30
Employees Inculcate Car Economies .. 84
End of Grants to Rates 258
Grading Principle Recognised 316
Grants to Rates from Tramways 258
Housing without Transport 195
Joint Industrial Council 83
Life of Rails 138
Locked Wheels on Curves 32
London Council's Tramways' Financial Difficulties 140
Melbourne Railway Electrification .. 30
Municipal Tramways' Peculiar Position .. 195
National Joint Industrial Council 194, 259
New Sort of Competition in New York .. 32
One-Man Safety Car 260
Order out of Chaos 83
Railway Electrification 314
Railway Termini and Electric Traction .. 316
Swansea Strike, Failure of.. 315
Tramway Fare Bill and the Industry .. 259
Tramway Statistical Returns 314
Tramway Wages Settlement 194
Trolley and Battery Combinations .. 31
Underground Railway Finance 138
Underground Railway Speeds 82
Vertical Motor Electric Locomotives .. 82
Wreckers 194
Electric Battery Vehicles of Metropolitan Railway* 99
Electric Locomotives, Chicago, Milwaukee and St. Paul 74, 307, 308
Gearless 307, 308
Gothard Line, Swiss Federal Railways* .. 251
Electric Lorry by General Vehicle Company*.. 164
Electric Railways, Belgian 32
Buenos Ayres 32
Chicago, Milwaukee 307
Gothard Lines* 251
Melbourne Suburban* 9
Swiss State*.. 251
Electric Traction in America, Investigations of French Commission 261
Melbourne* 9
Electric Welding in Building Construction .. 311
Electricity Supply Bill 270
Electrification of Melbourne Suburban Railways* 9
Polish Railways 73
Swedish Railways 72
Electrification of Railways, Appointment of Committee 208
Empire Roller Bearings* 230, 254
Employees' Demands 141

PAGE

English Electric Company, Annual Meeting .. 267
English Electric Journal, The 87
Eyesight of Drivers 209

F

Falkirk and District Tramways Company Omnibus Developments 221
Fares, Economic 33, 189
Sir A. Stanley on 33
Fares, Increased 34, 90, 145, 265
Buenos Ayres 76
Chicago 84
Financial Position of Municipal Tramways .. 205
Of American Public Utilities 319
Financial Reports and Meetings 35, 87, 145, 211, 267-8, 323
France, Light Tramway Cars in* 249
French Commission to America on Electric Traction 261
French Proposed Standard Rail* 250
Fuel Alcohol 96
Fuel Prices 44, 155
Fuel Prospect, The 155
Fuel Research Board 96, 155
Power Alcohol Investigation Officer .. 96

G

Gearless Electric Locomotive*.. 74
General Vehicle Company's Electric Vans for Parcel Services* 99
Giant Pneumatic Tires 333
Glasgow Fare Increases 311
Tramway Problem 206
Tramway Year 324
Gothard Railway Electric Locomotives* .. 252
Government Motor Cars 337
Great Eastern Railway Electrification Plans.. 90
Greater London Traffic Authority 200
Green Omnibus, The 50
Greenwich Power Station, Coal Conveying Plant 29

H

Halifax Motor Omnibus Costs 104
Halifax Transport Committee 156
Havre Tramway Cars* 249
Henley Tires, Catalogue of 230
High Tension Railway Working 9
Highways Control 220
Huddersfield Corporation Tramways Accounts 35

I

Ignition, Process of 162
Imperial Motor Transport Council 340
Increased Fares 34, 90, 142, 145, 265
Indicators for Stopping Places*.. 131
Institute of Transport 144, 197, 340
Presidential Address (Sir Eric Geddes) .. 197
Institution of Automobile Engineers 102, 162, 279
Appointments Register 203
Insurance Premiums 337

J

Johannesburg, Trees Overhanging Tracks .. 260
Joint Industrial Council for the Tramways Industry 34

Digitized by Google

PAGE

K

Karachi Tramway Cars* 27
Kearney High Speed System 257
Kilmarnock Tramway Employees, Award to .. 144
King's Message to Underground Railway Employees 33

L

Lancashire United Tramways Chars-a-bancs .. 281
Last Stand of the Reciprocating Steam Engine* 301
Leeds City Tramway Accounts 35
Leyland Motors, Ltd. 156
Chars-a-bancs* 103, 232
Company's School 51
Factory at Ham 156
Government Lorries Purchased by .. 96
Single-Deck Omnibus* 164
Light Tramway Cars in France* 249
Lights on Road Vehicles 232
Liverpool, Double-Deck Omnibus for* .. 97
Local Rates and Tramways 142
Loetschberg Railway Power Supply 305
London and Northwestern and Bakerloo Trains* 185
London County Council 208
Coal Conveying Plant at Greenwich .. 29
Highways Committee 201
Slack Hour or Midday Fares 208
London Electric Railway Fares 207
Rolling Stock—Bakerloo Trains* 185
London General Omnibus Company, Experiments with Pneumatic Tires 333
Safety First Competition 161
Taxation of Omnibuses of 333
Use of Military Motor Lorries 99
London Omnibus Stopping Places 264
London Omnibuses and Taxicabs 276
London Passenger Transport, Growth of .. 33
London Street Traffic Congestion 26
London Traffic Authority Proposed 200
Report of Advisory Committee on 137, 200, 255, 324
London Traffic Congestion 26, 210, 317
Control of 140
Lord Ashfield's Suggestions 317
Sir E. Geddes on 26
London Tramway Extension 86
Blocked 263
London Underground Railway Speeds .. 85
London United Tramway, Fares 320
Speed Limits 85
Londonderry Corporation Omnibus* 159
Lorry Omnibuses, Withdrawal of 99
Lymington and District Motor Services .. 283

M

Manchester Corporation Standard Car* .. 73, 129
Manchester Trunk Roads 333
Map, Chicago, Milwaukee & St. Paul Railway Electrification 302
Melbourne Suburban Railways 11
Omnibus Routes in Central Scotland .. 221
Marseilles, Projected Tube Railway for .. 201
Mechanical Transportation in the War .. 100
Melbourne, Cable Car* 9
Suburban Railways Electrification* .. 9
Mesopotamia Tramways* 256
Metropolitan District Railway Improvements 29
New Types of Car* 69
Shortened Stops 29
Metropolitan Railway Electric Battery Vans* 99
Rolling Stock* 70
Military Motor Lorries as Omnibuses 99
Ministry of Transport Committees 257
Principal Officers 137
Railway Electrification Policy 253
Review of Work of 137
Road Charges on Omnibuses 227
Work of Rates Advisory and Light Railways Committees 191
Work of Roads Advisory, Railway Advisory, Light Railways Advisory, etc., Committees 257
Mirrors for Motor Vehicles 337
Montreal Tramways, Snow Fighting on .. 85
Moscow Tramways Used for Goods 200
Motor Car Industry, Prices and Delays .. 228
Motor Coach Season 219
Motor Fuel Prices, Report of Profiteering Sub-Committee 157
Motor Industry Research 50
Motor Law Amendments 44
Motor Omnibus Costs at Halifax 104
Motor Omnibus Taxation 189, 219
Motor Omnibuses, Small 220
Motor Publications 340
Motor Rail and Tramcar Company* 27
Motor Repairing Trade Apprentices 336
Motor Research 44
Motor Taxes 199
Motor Traffic Notes 52, 104, 164, 231-2, 283, 339
Motor Traffic Section 43, 95, 155, 219, 275, 331
Motor Vehicles for Municipalities 51
Motormen's Pay 199
Municipal Electrical Association 266
Programme of Annual Conferences 266
Municipal Omnibus Powers 161
Municipal Tramways Association, Memorandum on Tramway Finance and Statutory Fares 141, 205
Municipalities, Motors for 51, 96, 163, 230, 282, 338

N

Napier Chars-a-bancs* 284
Lorry* 51
Tipping Wagon* 338
Natalite 97
National Joint Industrial Council for Tramways Industry 144, 265, 321
Application for Wage Increase 144
Decision of 321
National Steam Car Company 48
Withdrawal of London Service 48
National Union of Tramway Vehicle Workers, Conference of 204
Newcastle Omnibus Powers 229
Newport Track Reconstruction 133
New York Top-Covered Omnibus* 47
Non-Skidding Tires 49
Nottingham Omnibus Service 230

Digitized by Google

PAGE

O

Oldham Transport Committee 156
Omnibus and Coach Traffic 155
Omnibus Body, New Type of* 279
Omnibus Services* 281
Central Scotland* 221
Omnibus Stopping Places 264
Omnibus War Service Record 50
Omnibuses for Private Parties 281
Overhanging Trees 260

P

Paris Bogie Cars* 250
Single-Deck Cars 250
Partially Disabled Men as Drivers, Report on 209
Passengers "Profiteering" 33
Patent List .. 38, 90, 150, 214, 271, 327
Paulista Railway Electrification 270, 309
Paving Setts, Value of 324
Peacock Brakes 150
Personal 36, 88, 147, 210, 268, 325
Petrol and Benzol Prices .. 44, 102, 155, 157
Profiteering Committee's Report 230
Suggested International Inquiry 230
Petrol Driven Tramcar* 27
Petrol Duty 333
Petrol, Year's Consumption 333
Plymouth Motor Omnibuses 227, 334
Cars 227
Pneumatic-Tired Trucks 220
Polish Railway Electrification 73
Power Alcohol 96, 157
Power Station Capacity in the United States .. 305
Producer Gas for Motor Vehicles 45
Production Shortage 156
Profiteering Act Sub-Committee's Report .. 157
"Profiteering" by Passengers 33
Public Utilities Companies' Bill 268
Public Vehicle Taxation 95, 333
Publications 230, 337, 340

R

Rail Remodelling Tests* 132
Woods Gilbert System 132
Railless Accumulator Cars, Bradford* 160
Cost of 161
Ilford 227
Railless Electric Traction 81, 232, 312
Double Deck Cars (Bradford)* 81
Proposed for London 196
Railless Omnibus Costs 232
Rails for Dundee Tramways 313
Railway Advisory Committee 143
Fares 256
Railway Electrification, Belgium 32, 86
Buenos Ayres 32, 86
Dick, Kerr & Co. 313
Great Eastern 86, 135
Great Western 135
Lancashire and Yorkshire 135
London and North-Western 135
London and South-Western 135
London, Brighton and South Coast .. 135
Ministry of Transport Policy 253
North-Eastern 136

Railway Electrification—*continued.* PAGE
Paulista Railway 270, 309
Poland 73
Policy of Ministry of Transport 253
Spanish Electric Railway Concession .. 270
Sweden 72
Technical Committee 253
United Kingdom 85, 86
Railway Position, The 191
Research, Motor 44
Return Load Bureau 48
Road Charges on Omnibuses 99, 227
Lancashire 231
Road Transport Development 137
Road Transport Dispute, Arbitration in .. 144
Roads and Transport Exhibition 160
Roads Advisory Committee 52
Roads Committee, Joint 220
Roads for Omnibuses 264, 282
Roads Improvement Association 280
Roller Bearings for Tramcars* 254
Rolling Stock for Bakerloo and Watford Service* 185
Rolling Stock, New Types of, on Metropolitan and District Railways* 70
Rotherham Fares 47
Rouen Tramway Cars* 249, 250
Royal Commission on Railways 204
Rubber Tires, Use of 220
Rule of the Road 143

S

Safety Cars 193
Australia 255
United States 249
St. Helens Corporation Tower Wagon* .. 159
Sandberg Rail-Hardening Process on L.C.C. Tramways 209
Scottish General Omnibus Company* 221
Scottish Motor Show 51, 102
"Seeing Britain" by Coach 337
Shanghai Tramways 312
Car Construction 136
Railless Cars 136
Sheffield Single-Deck Omnibus* 158
Shortage of Steel Plates for Motors 268
Single-Deck Omnibus for Sheffield* 158
Slough Depot, Sale of 228
Small Cars used in France* 249
Snow Fighting on Montreal Tramways .. 85
Society of Engineers 100
Sopwith Aviation Company's Factory Bought by Leyland's, Ltd. 96
Southend Omnibus Scheme Deferred 104
Special Trackwork Standards 144
Speed Limits on London United Tramways .. 85
Speed Restriction on Motor Vehicles 232
Speeds on Leading Tramways 257
Speeds on London Underground Railways .. 85
Standard Cars, Manchester Corporation* .. 73, 129
Standard Rail, Proposed French Tramway* .. 250
Standardization 156
Tenders for Motors 161
Statutory Fares on Tramways 141
Statutory Undertakings (Increases of Charges) Act, 1918 143

Digitized by Google

PAGE

Steam Engine, Last Stand of 301
Steam Omnibus Withdrawal 48
Straker Chars-a-bancs for the Isle of Man .. 281
Single-Deck Chassis, A-type* 334
Street Accidents in 1919 231
Strikes of Tramway Employees 202
Swedish Railway Electrification 72
Swiss Federal Railway Electric Locomotives* 251

T

Taxation and Regulation of Vehicles, Committee on 277
Taxation, Future of Motor 43
Alternative Proposals 43, 95
Of Motor Omnibuses 219
Of Motor Vehicles 333
Technical Committee on Railway Electrification 253
Tenders for Motors, Standard 161
Thornycroft Achievements 336
Lorry on Porlock Hill 340
Tillings-Stevens Motor Coach* 227, 337
Omnibuses* 159, 221
In Central Scotland 221
Tires, Non-Skidding 49
Ten-Mile Movement on United States Railways 302
Top Covers for Omnibuses* 47
Tower Wagon for St. Helens Corporation* .. 159
Track Reconstruction at Newport* 133
Traction Vehicle Examination 334
Traffic Advisory Committee 161
Proposals for Traffic at Westminster .. 161
Traffic Census 137
Traffic Returns 40, 92, 152, 216, 272, 328
Trailer Cars at Shanghai 312
Train Indicators for Stopping Places* 131
Tramway Accounts, Bournemouth 282; Dublin, 87; Glasgow, 324; Huddersfield, 35; Leeds, 35; Liverpool, 211.
Tramway and Light Railway Notes 36, 88, 148, 212, 269, 325
Accrington, 148; Ashton, 88, 212; Ayr, 148, 269; Barrow, 36, 88; Bath, 88; Belfast, 36; Bexley, 36; Birmingham, 88, 269, 325; Blackburn, 212; Blackpool, 148; Bolton, 36, 269; Bournemouth, 148, 269, 325; Bradford, 212, 269; Brighton, 36, 212, 269; Bristol, 148; Burnley, 36, 148, 212, 269; Bury, 36; Cardiff, 88, 148, 212; Colchester, 37, 325; Darlington, 269; Derby, 37; Doncaster, 88; Dublin, 148, 212, 269; Dumbarton, 212; Dundee, 37, 88; East Ham, 37, 212; Edinburgh, 37, 88, 148, 325; Exeter, 325; Gateshead, 269; Glasgow, 37, 148, 212; Great Grimsby, 148; Greenock, 213; Hastings, 213; Huddersfield, 37, 89, 148; Hull, 213; Ipswich, 89; Keighley, 325; Kirkcaldy, 148; Leeds, 37, 89, 149, 213; Leicester, 149, 213, 269; Leyton, 89, 325; Lincoln, 37; Lincolnshire, 37; Liverpool, 89, 149, 213, 269, 326; Llandudno, 149; London, 37, 213, 269, 326; Maidstone, 149; Manchester, 89, 149, 269; Middlesbrough, 89; Newcastle-on-Tyne, 37, 213; Nottingham, 37, 326; Oldham, 89, 326; Paisley, 269; Plymouth, 37, 89, 149; Pontypridd, 213; Portsmouth, 149; Potteries, 270; Preston, 149; St. Helens, 37; Sheffield, 149, 270, 326; South Shields, 37; Southend, 213; Southport, 213; Sunderland, 326; Swansea, 37,
Tramway and Light Railway Notes—*continued.* PAGE
326; Tees-side, 213, 270; Torquay, 213; Walsall, 149; Walthamstow, 149; Warrington, 149; Wolverhampton, 270; York, 89, 149, 213.
Tramway Extension, Commonsense View of .. 28
Tramway Finance 141, 205
Municipal Tramways Memorandum .. 141
Tramway Industrial Council 34
Tramway Legislation 204
T. O. T. Philharmonic Society's Concert* .. 264
Tramway Speeds 85, 257
Limits 85
Tramway Workers' Wages 144, 202
Application for 10s. Increase 144
Proceedings of National Council 202
Tramways (Temporary Increase of Charges) Act, 1920 .. ..204, 320
Text of 320
Tramways and Light Railways Association .. 326
Tramways in Mesopotamia 256
Transport Man's Visit to America (C. J. Spencer) 192
Transport Ministry, Work of 191
Sir E. Geddes on 191
Trees Overhanging Tramway Tracks 260
Trolley Omnibus, Estimate of Working Costs of 189

U

Underground Railway Efficiency Meetings .. 201
Employees' Reunion 34
T. O. T. Philharmonic Society's Concert* 264
United States, Coal Saving by Electrification 303
Fuel, 1918, ... 303
Power Station Capacity 305
Railway Statistics 302
Ten-Mile Movement 302
Use of Light Tramway Cars in France* .. 249

V

Vestibule on Manchester Cars* 129
Veto of Metropolitan Boroughs Sustained .. 263
Victoria State Railways 9
Vulcan Motor Company's Production 336

W

Wage Increase Demand 144, 265
Wages Negotiations 265, 321
Walchem Lake Power Station 28
War Honours Conferred 210
War, Mechanical Transport in 100
War Service Record of L.G.O.C. Omnibus No. B.43 50
Welding on New England Tramways 133
Willesden Council Cars 000
Window Wiper, Automatic* 71
Wolverhampton Investigation of Electric Vehicles 51
Woods Gilbert Rail Remodelling System, Test of* 132
Working Costs of Tramway Car, Motor Omnibus and Trolley Omnibus Compared .. 189

Z

Zone Fares in America 77

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MOTOR TRAFFIC SECTION

PAGE

Adaptation of Roads for Omnibuses 264
Admiralty Motor Vehicles 162
Albion Char-a-bancs* 164, 281
Chassis ordered for South Africa 282
New Factory 332
Alcohol for Fuel 96
Alcohol derived from Coke 49
Ambulances for Hospitals 338
Army Lorries, Sale of 157
Associated Equipment Company Char-a-bancs* 340
Omnibus for Lymington District* .. 183
Omnibus for Stockport* 162
Tipping Wagon* 339
Austin Motor Company 102
Automobile Engineers' Employment Register 203
Beck Omnibus Cover* 48
Belgian Petrol Company, A New 229
Benzol, Rise in Price of 102
Bethlehem Motor Vehicles* 229
Blue Bird 'Bus* 338
Bournemouth Corporation Omnibus Accounts 282
Bradford Return Load Bureau 48
Brighton and Hove Omnibus Lease 161
British Electric Traction Co. Omnibus Service 49
British Standard Rubber Tires and Rims .. 83
Central Scotland Omnibus Services 221
Challenge Shield, Freedom from Accidents .. 280
Chars-a-bancs, Albion* 164, 281
Associated Equipment Company*, 340; Dennis*, 232, 280; Lancashire United Tramways*, 281; Leyland*, 103, 232; Napier*, 284; Straker*, 281; Tillings-Stevens*, 227, 337
Charges for Omnibus Traffic 99
Chicago Truck Show, Pneumatic Tires at .. 220
Classification of Roads 276
Coaching Developments 337
Commercial Motor Parade 156
Commercial Motor Users Association—Annual Report 231
Dennis Lorries* 49
Touring Coach* 281
Tower Wagon* 159
Disposal Board, Policy of 157
Dodson Single Deck Omnibus* 158
Double-Deck Omnibuses, Bradford Railless* 81
Liverpool Motor* 97
Du Cros, Ltd., W. & G., Commercial Vehicles .. 228
Edinburgh Chars-a-bancs* 103
Motor Omnibuses 99, 162, 232, 257
Electric Lorry by General Vehicle Company .. 164
Electric Vehicles 99, 164
Metropolitan Railway* 99
Empire Roller Bearings Catalogue 230
Falkirk and District Tramways Company, Omnibus Developments 221
Fuel Alcohol 96
Fuel Prices 44
Fuel Prospect, The 155, 275
Fuel Research Board 96, 155
Power Alcohol Investigation Officer .. 96
G. V. C. Electric Van* 99
Giant Pneumatic Tires—London General Omnibus Company's Experiments 333
Government Motor Cars 337
Green Omnibus, L.G.O. Company's 50

PAGE

Halifax Motor Omnibus Costs 104
Halifax Transport Committee 156
Henley Tires Catalogue 230
Highways Control 220
Ignition, Process of 162
Imperial Motor Transport Council 340
Indirect Profits from Motor Taxation 276
Institute of Transport 340
Institution of Automobile Engineers 102, 162, 279
Insurance Premiums 337
Lancashire United Tramways Chars-a-bancs* 281
Leyland Chars-a-bancs 103, 232
Single-Deck Omnibus* 164
Leyland Enterprise—R.A.F. Vehicles Purchased, 96; Factory at Ham, 156; School, 51
Lights on Road Vehicles 232
Liverpool's New Omnibus* 97
London General Omnibus Company,
Experiments with Giant Pneumatic Tires 333
Safety First Competition 161
Taxation of Omnibuses 333
Use of Military Lorries 99
London Omnibus Stopping Places 264
London Omnibuses and Taxicabs 276
Londonderry Corporation Omnibus* 159
Lorry Omnibuses, Withdrawal of 99
Lymington and District Omnibus* 283
Manchester Trunk Roads 333
Map Scottish General Omnibus Company's Routes 221
Metropolitan Railway Company's G.V.C. Vehicles* 99
Military Lorries as Omnibuses 99
Ministry of Transport Decision on Road Charges on Omnibuses 227
Mirrors for Motor Vehicles 337
Motor Car Industry, Prices and Delay 228
Research 44, 50
Motor Coach Season 219
Motor Fuel Prices—Report of Profiteering Sub-Committee 157
Motor Law Amendments 44
Motor Omnibus Costs—Halifax 104
Motor Omnibus Taxation 219
Motor Omnibuses, Small 220
Motor Publications 340
Motor Repairing Trade Apprentices 336
Motor Research 44
Motor Taxation .. 43, 95, 219, 275, 277, 333
Schedule of Rates Proposed 199
Motor Traffic Notes .. 52, 104, 164, 231, 283, 339
Motor Vehicles for Municipalities 51, 103, 163, 230, 282, 338
Municipal Omnibus Powers 161
Municipal Transport in War 100
Municipal Vehicles 96
Napier Chars-a-bancs 284
Lorry 51
Tipping Wagon* 338
Natalite Spirit 97
National Omnibus and Transport Co. 48
National Steam Car Company 48
London Service Withdrawn 48
New Motor Taxation 275
New York Top-Covered Omnibus* 47

Digitized by Google

PAGE

Newcastle Omnibus Powers 229
Non-Skidding Tires 49
Notes and Comments (Motor Section) .. 43, 95, 155, 219, 275, 331
Amendment of Motor Law 44
Disunion in the Motor Industry 332
Fuel Prices 44
Prospects 155, 275
Future of Taxation 43
Indirect Profits from Motor Taxation .. 276
Motor Coach Development 332
Motor Coaching Season 219
Motor Omnibus Taxation 219
Motor Research 44
Municipal Vehicles, Petrol and Electric .. 96
New Taxation 95, 275
Omnibus and Coach Traffic 155
Penalty of Disunion in Motor Industry .. 332
Public Vehicle Taxation 95
Rates of Exchange 332
Rubber Tires 220
Shortage of Production 156
Small Motor Omnibuses 220
Speed Limits 331
Taxation, by Power 43
New Proposal 95, 275
Of Horsed Vehicles 275
Unladen Weight 331
Nottingham Motor Omnibus Service 230
Oldham Transport Committee 156
Omnibus and Coach Traffic 155
Omnibus Body, New Type* 279
Omnibus Services 221, 281
Central Scotland* 221
Omnibus Stopping Places in London 264
Omnibus War Service Record 50
Petrol, A Year's Consumption 333
Petrol Duty 333
Petrol Prices 44, 102, 155, 157
Suggested International Inquiry 230
Plymouth Motor Omnibuses* 227, 334
Pneumatic-Tired Trucks 220
Power Alcohol 96, 157
Process of Ignition 162
Producer Gas for Motor Vehicles 45
Profiteering Committee's Report 230
Sub-Committee's Report 157
Public Vehicle Taxation 95
Punitive Taxation 333
Railless Accumulator Cars Proposed for Ilford 227
Railless Battery Vehicles at Bradford* .. 160
Costs of Working 161

PAGE

Railless Omnibus Costs 189, 232
Research, Motor 44
Return Loads Bureau 48
Road Charges on Omnibuses 99, 227
Lancashire 231
Road Transport in the Railway Strike 230
Roads and Transport Exhibition 160
Roads Advisory Committee 52
Roads Committee, Joint 220
Roads for Omnibuses 264, 282
Roads Improvement Association 280
Rotherham Fares 47
Rubber Tires, Use of 220
St. Helens Corporation Tower Wagon 159
Scottish General Omnibus Company* 221
Scottish Motor Show 51, 102
"Seeing Britain" by Coach 337
Sheffield Single-Deck Omnibus* 158
Shortage of Steel Plates for Motors 268
Single-Deck A-type Chassis* 334
Single-Deck Omnibus for Sheffield* 158
Slough Depot, Sale of 228
Society of Engineers 100
Sopwith Aviation Factory Bought by Leylands 104
Southend Omnibus Scheme Deferred 104
Speed Restrictions on Motor Vehicles 232
Standardisation 156
Tenders for Motors 161
Straker Char-a-bancs for the Isle of Man .. 281
Street Accidents in 1919 231
Taxation and Regulation of Vehicles, Committee on 277
Taxation of Motor Vehicles, Present and Proposed 43, 333
Horsed Omnibuses 275
Motor Omnibuses 43, 219
Tenders for Motors, Standard 161
Thornycroft Achievements 336
Lorry on Porlock Hill 340
Tillings-Stevens Motor Coaches* .. 119, 221, 337
Omnibuses 119
Tires, Non-skidding 49
Top Covers for Omnibuses* 47
Traction Vehicle Examination 334
Traffic Advisory Committee 161
Proposals for Traffic in Westminster .. 161
Vulcan Motor Company's Production 336
War, Mechanical Transport in 100
War Service Record of L.G.O.C. No. 343 50
Willesden Council Car 49
Wolverhampton—Electric Vehicles 51
Working Costs of Motor Vehicles .. 189, 232

PERSONAL REFERENCES AND AUTHORS' INDEX.

PAGE

Armstrong, A. H. 301
Ashfield, Lord 36, 199
Bearce, M. D. 74
Beaumont, M. Worby .. 49
Beckett, J. 205
Bellamy, L. C. F. 159
Blain, H. E. 199
Brochuer, Georg 72
Burford, H. G. 333
Burgess, Capt. Chas. .. 256
Dalrymple, J. 311
Fearnley, A. R. 158
Garcke, E. 192
Geddes, Sir E. 191
Harvey, L. E. 227
Hays, D. 227
Hickman, W. J. 279
How, Thomas W. 154
Lanchester, F. 228
McColl, Donald 312
McElroy, J. M. 73, 129
Mallins, C. W. 97
Mauduit, M. 261
Maybury, Sir H. 199, 277
Moore, A. Nichols 133
Nathan, Sir F. 96
Pilcher, R. Stuart 80, 232
Pringle, P. J. 255
Robson, W. T. 85
Smith, Lt.-Col. D. J. .. 45
Spencer, C. J. 192
Spurier, H. 96
Stanley, Sir A. 33, 36
Young, A. P. 162
Wallace, S. A. 228
Warren, H. 162
Wilkinson, R. H. 81, 160

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THE Tramway & Railway World
WITH MOTOR TRAFFIC SECTION

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ELECTRIFICATION OF MELBOURNE SUBURBAN RAILWAYS.

IMPORTANT EXAMPLE OF HIGH-TENSION DIRECT-CURRENT WORKING.

The railway system of the State of Victoria is operated by the State Government, and the executive functions are exercised by Railway Commissioners, of whom there are normally three. At present, however, there are two Commissioners only, Mr. C. E. Norman (chairman) and Mr. W. M. Shannon. The scheme of electrification, which is here described, owes much of its success to the late Mr. E. B. Jones, a Commissioner, whose death before the completion of the work was a serious loss to the Victorian railways.

The suburban railways cover an unusually large area in spite of there being an excellent cable tramway, and deal with a large amount of traffic which in other cities is dealt with by electric tramways, interurban railways, or motor omnibuses.

The question of converting the Melbourne suburban lines to electric traction was first proposed in 1896. Two years later and again in 1901 the matter was considered by Select Committees; but nothing was done until 1907, when, at the request of the Hon. Sir Thomas Tait,

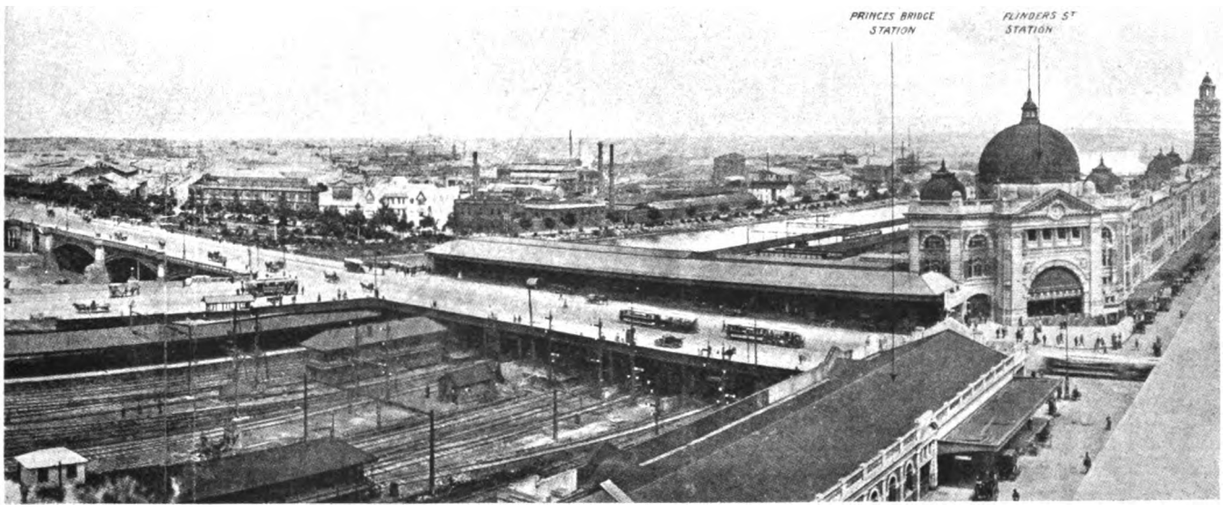

Fig. 1.—Princes Bridge and Flinders Street Stations, into which Electric Trains Run.
Cable Cars of the Melbourne Tramway Trust are seen Crossing the Bridge between the Stations.

The total track mileage of the railways is some 4,300, of which over 300 miles are suburban lines serving the city of Melbourne. The importance of the Melbourne suburban traffic to the whole system is shown by the fact that it accounts for some two-fifths of the total train mileage of the railways entering Melbourne. Not only are the suburban railways of greater importance to the system as a whole than in other countries, but they are of greater importance to the city itself than are the suburban systems of most other cities. Owing largely to the foresight of the authorities responsible for laying out the city, the density of population is only about one-fifth of that commonly found in this country. The result is that

K.C.M.G., chairman of the Commissioners, Mr. Charles H. Merz, M.Inst.C.E., visited Melbourne, and in June, 1908, presented an exhaustive report on the whole question. This report showed that although there would be a considerable saving in operating expenses, an increase of traffic would be necessary to cover the capital charges, and action was postponed. By 1912, however, the traffic had increased very much more than had been estimated and sufficiently to necessitate either expensive track widenings or, alternatively, to justify the capital expenditure involved in electrification, even if this produced no additional traffic. At the request of the Hon. W. A. Watt, then Premier of the State of Victoria, a further report was

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presented by Messrs. Merz and McLellan, based upon actual tenders from manufacturers. Alternative prices were obtained for the single-phase and direct-current systems. The latter proved to be substantially cheaper both in capital expenditure and operation. Contracts were therefore placed providing for the conversion of the whole of the suburban lines to the high-tension direct-current system, the work to be carried out in three stages. With the exception of the coach equipments, all the contracts have been executed by British or Australian firms, with the stipulation that manufacture for the British contracts was to be carried out in this country. The coach equipments were ordered in America, with the special condition that some of the motors were to be made in England.

The scheme is one of the largest and most important railway electrification schemes as yet carried out. The leading engineering features are the production of electric power at 3,300 volts, between phases, by means of 3-phase, 25-cycle, turbine-driven alternators, raised to 20,000 volts by static transformers, its transmission to sub-stations, where it is converted to 1,500-volts direct current, and at this pressure supplied to the trains by means of an overhead contact wire. The main contracts were placed in March, 1912, work started in November, 1913, and the first train was run on May 29, 1919. The work has, of course, been much delayed by the war.

Fig. 2.—Newport Station from River Yarra.

Power Station—General Features.

The power station (Fig. 2) was originally to have been placed on the River Yarra at Yarraville, the nearest available site to Melbourne having a good supply of condensing water and reasonable access by rail. While the detailed plans were being developed, however, it was found that the prospective harbour works might interfere with the existing course of the river and reduce the quantity of condensing water to that required for the suburban railways alone, leaving no future margin for additional power for other purposes. It was therefore decided to adopt a site at Newport (Fig. 3) which had advantages in connection with condensing water, subsoil, etc., which compensated for the additional expenditure on transmission cables. Thus the existence of a stone breakwater enabled the intake and discharge to be separated in a manner which is not ordinarily obtainable without considerable expense. The site (Fig. 4) consists of some 36 acres of land adjoining the Williamstown Ferry, and is mostly situated on basaltic rock which, while providing a satisfactory foundation, involved considerable extra work, some 45,000 cubic yards having to be removed. The site has been laid out to contain two power stations side by side, the position of the future station being indicated by broken lines on the plan. In this way full advantage may be taken of any future developments in power station design without interfering with the symmetry of the present station. The first station is laid out to contain six 10,000-kw. turbo-alternators, which suffices for present requirements and allows two sets spare for the purpose of standby and overhaul. The two boiler houses are at right angles to the engine room, and each is provided with its own coal store and coal handling machinery. The elevation of the power station is shown in Fig. 2; it is necessarily a compromise between the expense of a purely architectural design and the inartistic nature of a building for containing machinery pure and simple, but the result is distinctly pleasing. Between the two boiler houses is a space occupied by a general purpose building containing stores, water storage tanks, workmen's accommodation, laboratories, test tanks, etc. Placing these accessories in this position is not only satisfactory from the architectural point of view, but has proved efficient as regards administration and working. The separation of the engine room from the boiler house by a lower pump room has a good effect and the low symmetrically arranged chimneys are not an eyesore.

Each prime mover is treated as far as possible as an independent unit; thus each turbo-generator has its own oil-cooled step-up transformer for stepping up to 20,000 volts, and a unit transformer stepping down to 440 volts for operating the circulating water pumps, oil cooler pumps, air filter pumps, etc.

Although experience seems to indicate that oil in transformers presents a negligible fire risk, it was thought wise to instal the transformers belonging to each generator in a separate chamber outside the engine room; being out of reach of the engine room crane, special provision is made for lifting the transformers off railway trucks. Between the transformer chambers are intervening chambers containing air filters, neutral resistances, etc. The whole of the condenser, boiler feed, transformer, air cooler, turbine oil cooler, and air filter auxiliaries are placed on the same level in the basement and easily accessible, the basement being well lit and free from obstructions.

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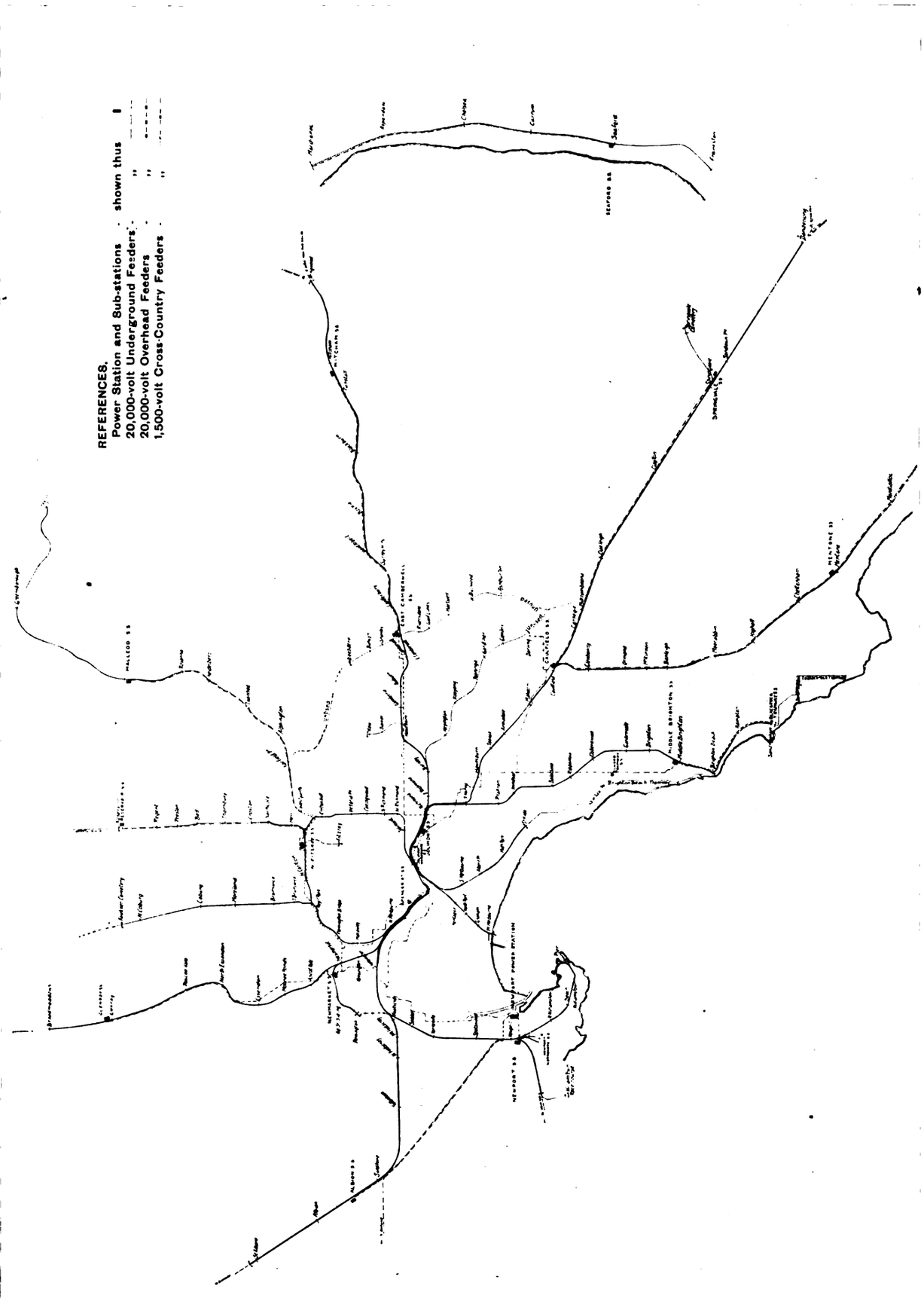
REFERENCES.
Power Station and Sub-stations - shown thus
20,000-volt Underground Feeders - " "
20,000-volt Overhead Feeders - " "
1,500-volt Cross-Country Feeders - " "

Fig. 3.—Map of Melbourne Suburban Railways with Power Transmission System.

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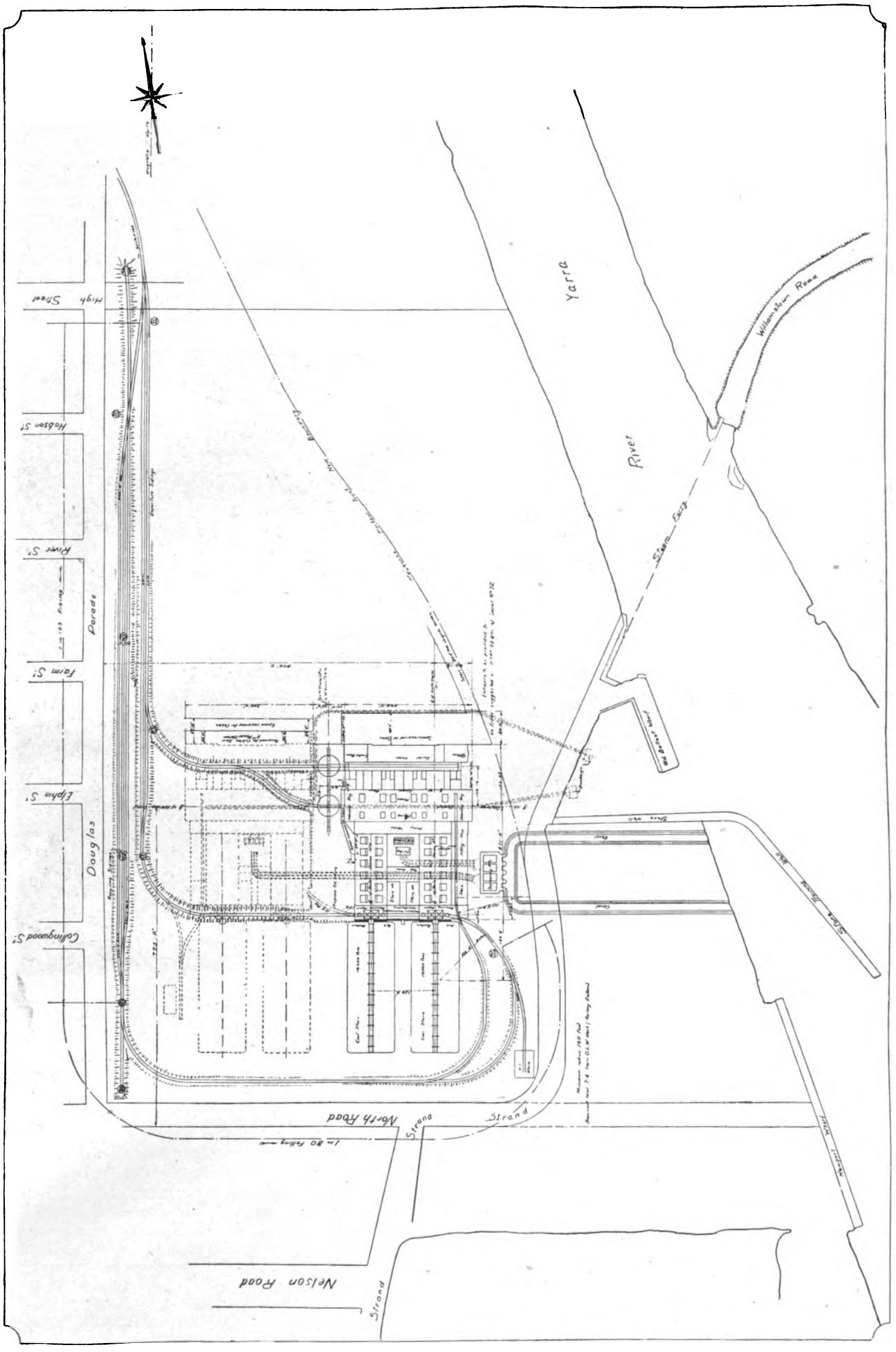

Fig. 4.—Site Plan of Newport Power Station

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Turbo-generators.

The turbines (Fig. 5) are of the Parsons pure reaction type, with divided cylinders, the H.P. portion is of the single flow type, the L.P. of the double flow type with central admission. The tandem type turbine, in large sizes, has advantages both as regards economy and manufacture; the cylinders are not exposed to such extreme ranges of temperature, and with double flow in the L.P. the length of the last few rows of exhaust blades can be kept down. A recent innovation is the absence of any rigid connection between the steam chest and turbine cylinder, thereby lessening the risk of undue stresses and allowing of a more uniform mass of metal round the periphery than when the steam chest is actually mounted on the cylinder. The construction of the stator windings of the alternator is interesting. Cotton-covered stranded wires are led up into an oval conductor the full area of the slot; each conductor is soldered to a flat copper end-connection, simplifying the end-connection and facilitating rigid anchoring.

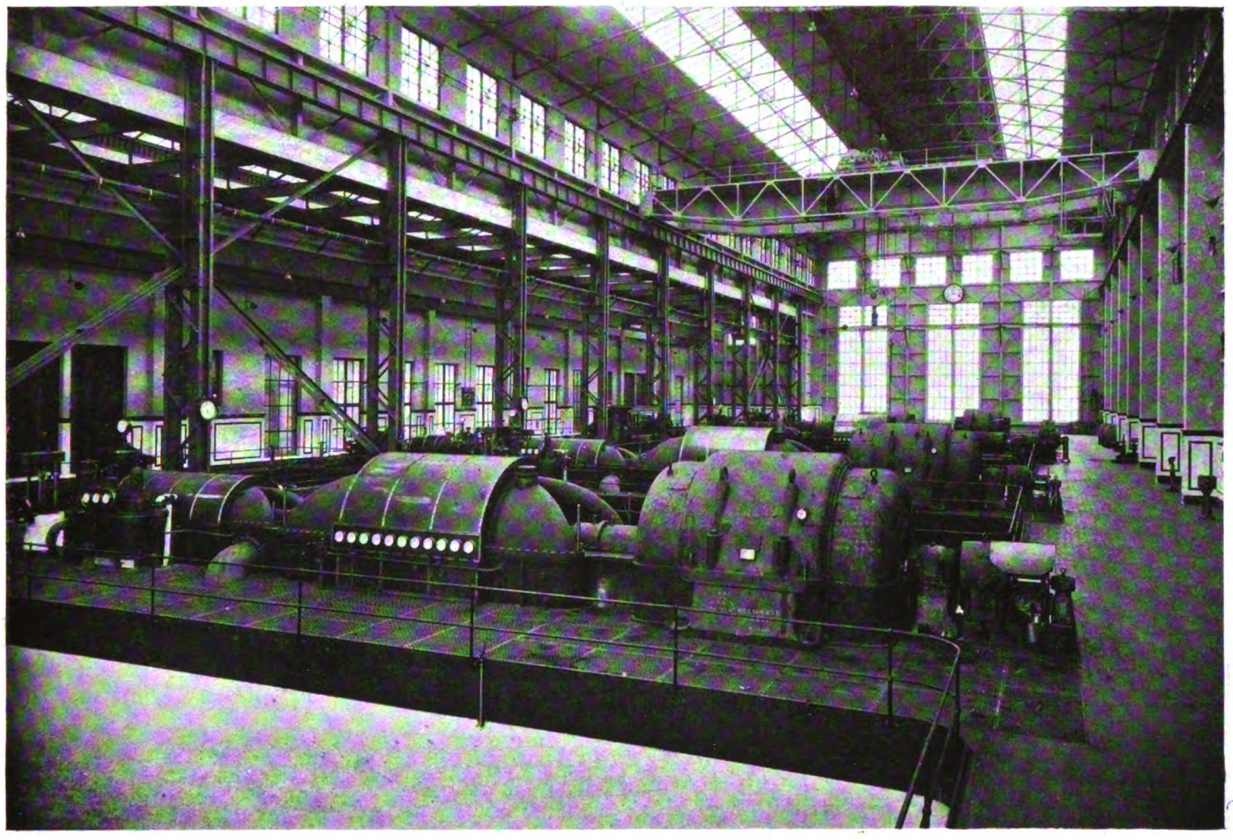

Fig. 5.—Interior of Turbo-Generator Room.

The boilers (Fig. 6) are of the Babcock and Wilcox marine type, and the circulating pumps are driven by vertical induction motors equipped with Michell thrust bearings—an Australian invention—and installed on the level of the turbine floor. The water supply to the pumps is in duplicate, with arrangements made so that four pumps may be supplied from each half of the duplicate system. As this is sufficient for the full load output of the station, overhaul operations in connection with the maintenance and upkeep of the water supply system can be carried out at any time as a matter of routine.

The boiler house is provided with suction ash plant, so that it is not necessary to remove ashes by hand and tip them into railway wagons. This plant also deals with the soot from the economisers, an improvement upon the usual arrangement employing small tipping wagons. The mechanical coal-handling arrangements permit of the fuel, which is delivered in railway trucks, being deposited in the overhead bunkers of the boilers or in the coal stores, or taken from the stores and delivered to the bunkers, no manual labour being employed. A luffing jib crane is provided for depositing the coal in each coal store, and it can deliver coal direct from the store to the boiler-house conveyors without using the coal store conveyor. In short, the whole of the boiler-house equipment has been laid out with special attention to the reduction of manual labour.

Switch House.

One of the most interesting features of the installation is the switch house. This is parallel to the engine room but at some slight distance from it, there being no attempt to provide ready communication between the switch house and the engine room staffs except by telephone and telegraph. It will be noted from the diagram of the high-tension transmission system (Fig. 25) that the station busbars are divided into two sections by means of a section switch, each sub-station being fed from both sections. So far as security of supply is concerned, therefore, the arrangement may be regarded as equivalent to duplicate busbars without the complication and expense of the latter. Another feature is the arrangement for preventing accidents, a system of mechanical interlocking being provided which prevents all possibility of an operator obtaining access to conductors while they are alive. This applies not only to the conductors of each switch panel, but to the sections of the busbars themselves; that is to say, access to each section of the busbars is entirely prevented until the whole of the isolating switches connected to it are open, thus ensuring that the busbars

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are dead. In addition, each oil switch is interlocked with its isolating switches, so that the latter cannot be opened or closed while the oil switch is closed. The oil switches are, of course, electrically operated with remote control, the operating mechanism having a wall separating it from the oil switch chamber so that it can be examined and cleaned without danger.

An interesting feature is the absence of windows in the switch house. One side of each switch cell is open to the outside air in order immediately to release any excessive air pressures in the event of an unusually heavy short circuit. Precautions are, of course, taken to prevent trouble from birds, rain, etc.

Each phase of the main switches is a separate single-pole switch in its own oil tank, the parts working in air being isolated from the parts working in oil. Each single-pole switch has multiple breaks in series arranged vertically close together in the middle of the tank, with insulating barriers between adjacent breaks, there being four breaks in the single-pole generator oil switches. These are so connected that upon the switch opening under load the mutual induction of the arcs produces a radial blow-out effect towards the insulated wall of the tank. Opening speeds up to an equivalent of 50 ft. per second can be obtained, aluminium being employed to ensure rapid acceleration. The gases produced are discharged to the outer passage way.

The three-phase oil switch will safely open a short circuit on a system controlling power of a rated capacity of 240,000 kilovolt-amperes. The operating gear consists of a rotary type magnet actuating a countershaft through a toggle mechanism and tripping box, the magnet being excited from a 110-volt battery supply and contactor, operated from the control board.

In addition to red and green indicating lamps, there is an alarm bell device to give warning when the switch has opened.

The generator equipments are fitted with Merz-Price protective gear, while feeder equipments have split conductor protective gear. Each generator has an emergency control pillar and load indicator fixed in the engine room.

Control Room.

This is situated at the end of the switch house. In it is centred not only the control of the main power station switches of the generators and transmission feeders, but all electrical operations throughout the entire transmission and conversion system are directed from this point. On the control engineer rests the responsibility of all electrical switching operations, and his control is absolute. A gallery is provided for visitors, although there is little to attract the attention of the non-technical observer during operations. The most striking feature is a huge diagram covering one wall of the room, showing the position of all principal switches on the system.

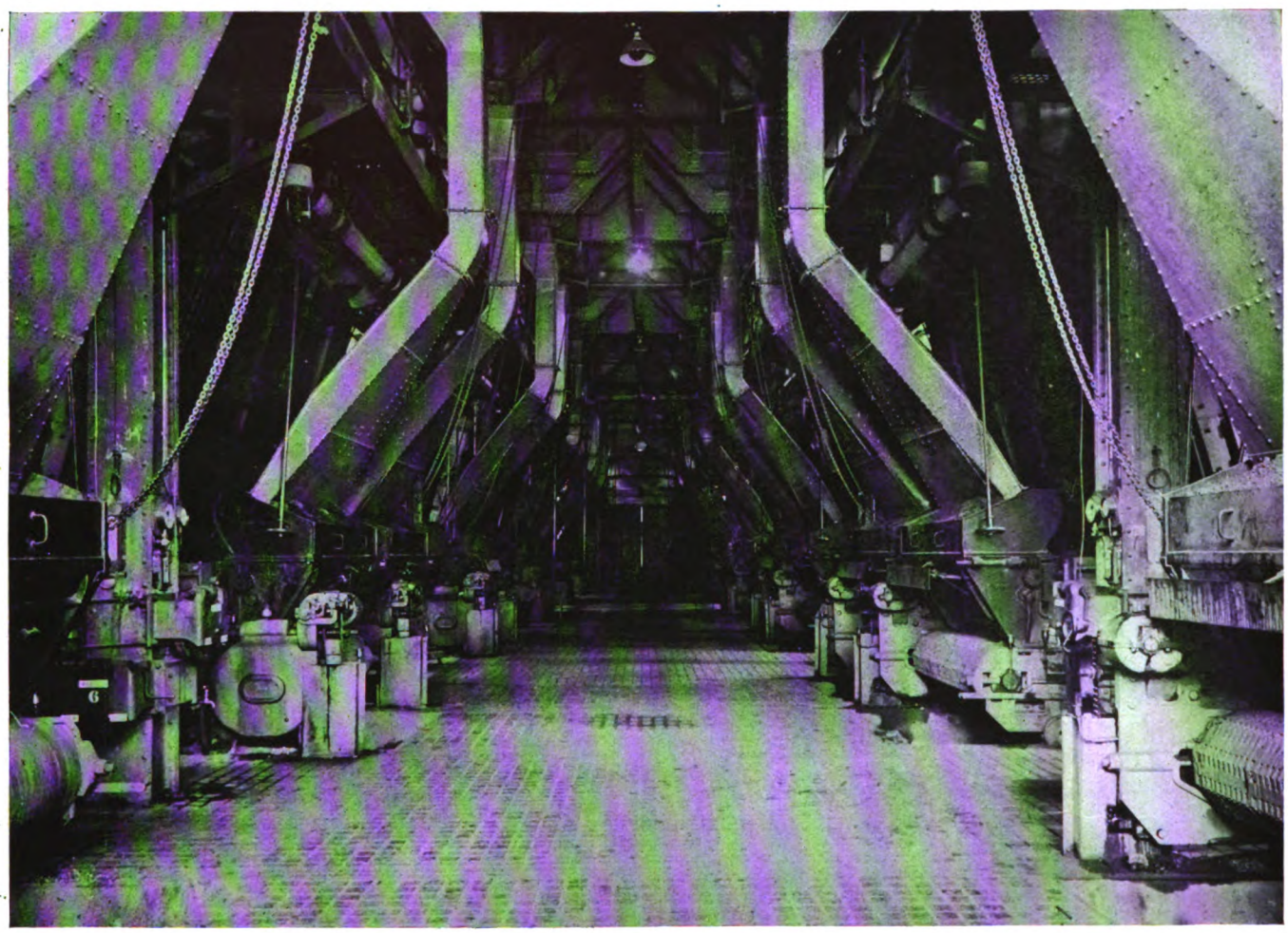

Fig. 6.—View of the Boiler Room—Babcock and Wilcox Equipment.

Rolling Stock.

The trains are operated on the multiple unit system, under which, instead of employing locomotives, every second or third car is equipped with motors, and the weight of these cars is thus available for adhesion purposes. Under this system a complete train is made up of a number of motor cars and trailers, easily varied to suit the varying conditions of traffic.

Although it had been intended at one time to make up definite "units" consisting of one motorcar and one trailer, each equipped for driving from one end, only a limited number of trailer cars have, for the present, been equipped with driving apparatus. The normal

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six-car train (Fig. 7) has a motor car at each end, with a third motor car about the centre of the train. No special type of car has been designed for Melbourne, the existing rolling stock being, as a rule, utilised. Some 45 per cent. of the rolling stock will consist of compartment cars with swing doors, the remainder being of a combination type, having sliding doors and

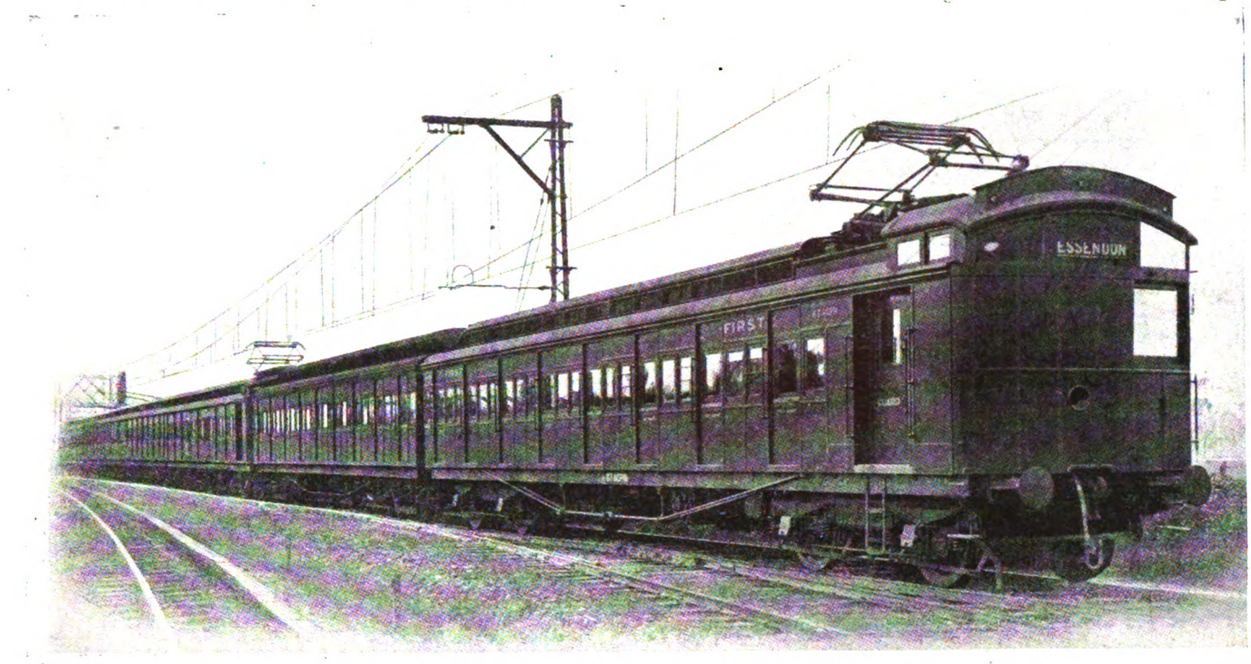

Fig. 7.—Electric Train—Melbourne Suburban Railways.

cross seats, with a corridor. Most of these cars are partitioned into smoking and non-smoking compartments.

As no new swing door cars are being constructed for the electric lines, the bodies of the existing cars are being transferred to new underframes and bogies of a type uniform with those used in the sliding door cars. Some of the sliding door trailer cars have also been

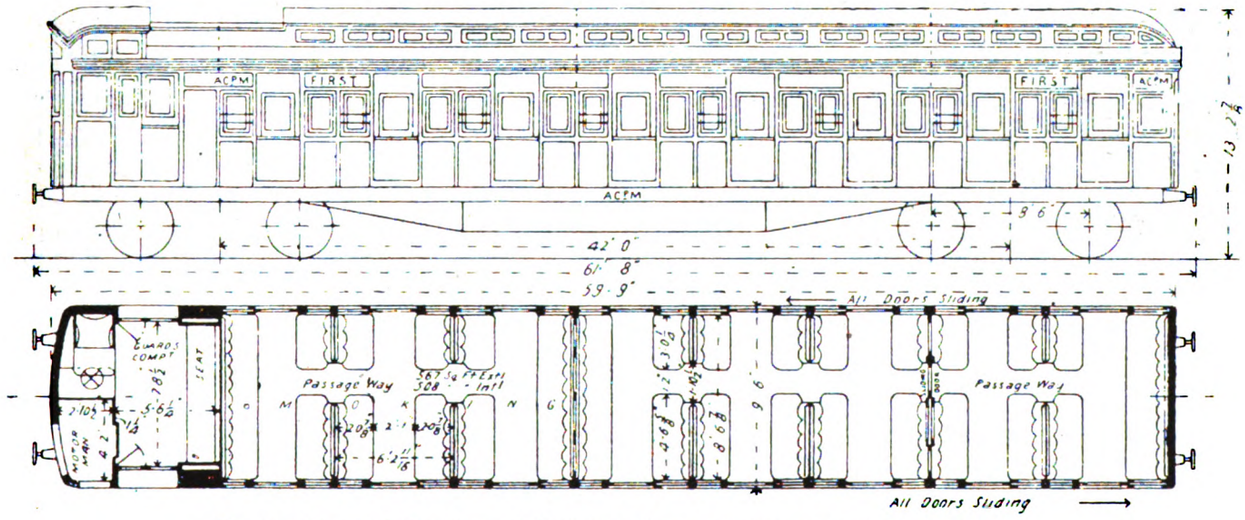

Fig. 8.—Plan and Elevation of First-class Coach—Melbourne Suburban Railways.

running in the steam service, but new sliding door motor cars are being constructed for the electric service. Fig. 8 gives a plan and elevation of the sliding door type. The swing door cars are similar to those used on British railways. The sliding door cars have a centre passage way throughout, but no vestibule, so that it is not possible for passengers to pass from one car to another. The body framing of the new cars is of teak, but Australian woods have been used wherever possible, the interior being finished in Queensland maple. The seats in the first class cars are covered with green Australian leather; those in the second class with brown duck cushions. The whole of the rolling stock has been built in the State railway workshops at Newport. Fig. 10 shows the Westinghouse brake wiring diagram; and Fig. 13 shows the wiring arrangements on the car.

Electric Equipment.

Each motor car has four motors of 140 H.P., the gear ratio being so proportioned that the maximum speed will be 52 miles per hour on level tangent track. They are of the GEE 237 type, normally for 750 volts (Figs. 9, 11 and 14).

The total pressure of the pantograph (Fig. 12) on the contact wire is such that with a reasonably clean wire the pantograph is able to collect considerably

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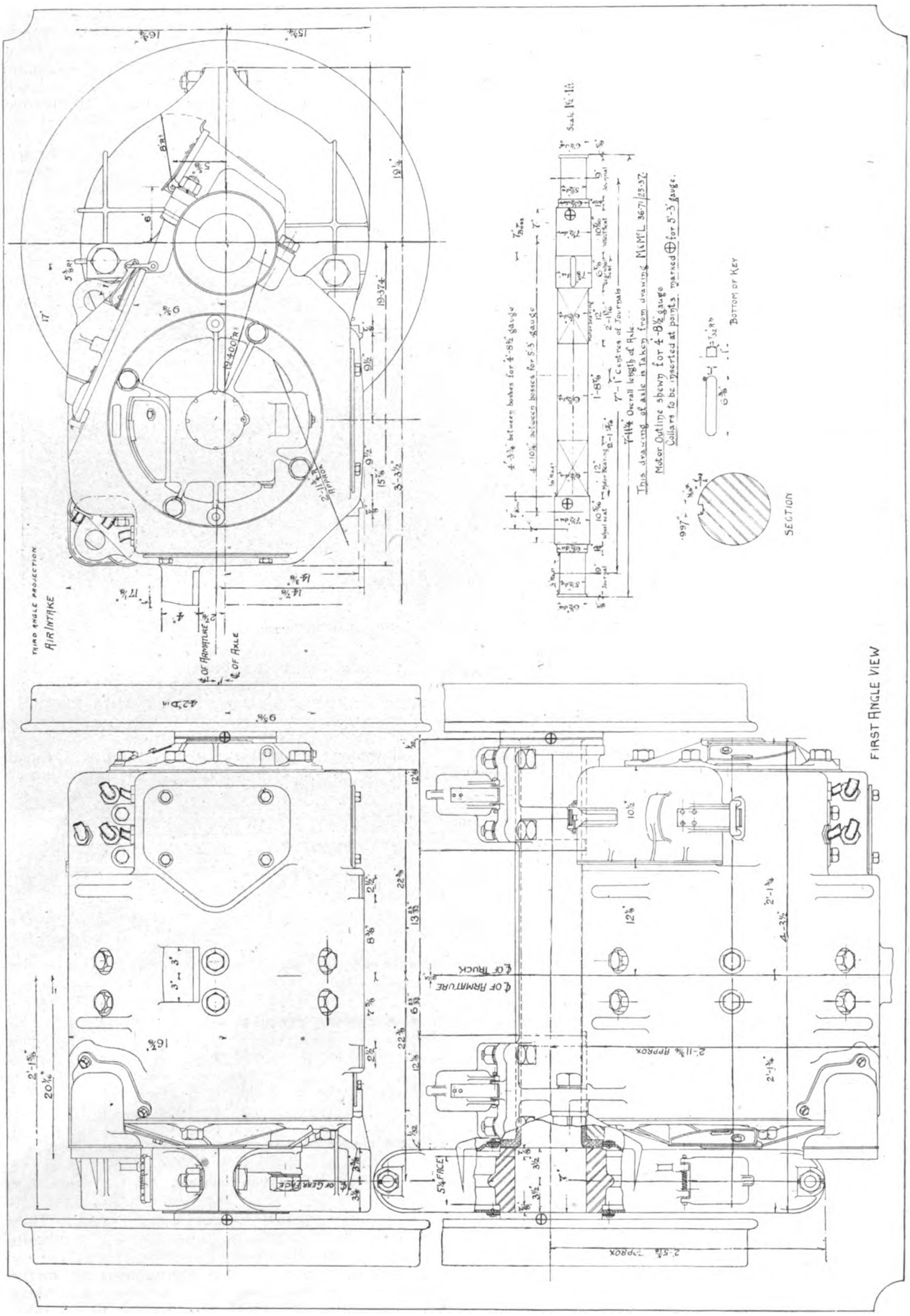
THIRD ANGLE PROJECTION
AIR INTAKE
Shaft No. 111
Motor Outline shewn for 4'-8½" gauge
Collars to be inserted at points marked ⊕ for 5'-3" gauge.
SECTION
BOTTOM OF KEY
FIRST ANGLE VIEW

Fig. 9.—Outline of Type G.E.E. 237 Form A Motor used on Melbourne Suburban Railways.

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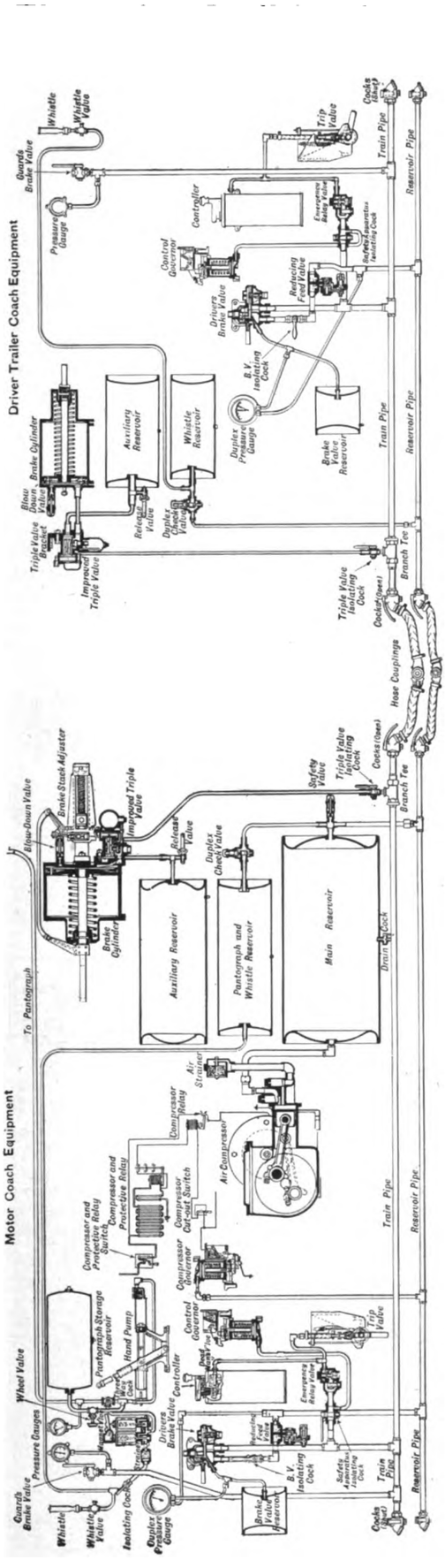

Fig. 10.—Westinghouse Brake Wiring Diagram.

over 500 amperes, which is the normal maximum operating current for each motor coach, without sparking, from a contact wire ·25 sq. in. cross section. The pantograph has a working range between 14 ft. 6 in. and 21 ft. 6 in., the working pressure being maintained by means of springs. The pantograph is brought into and taken out of action by pistons in cylinders mounted on the frame of the collector. Air pressure for the initial operation of the pistons is supplied in the first instance by a hand pump installed in the guard's compartment; the motor pumps can then be started up and the subsequent air pressure obtained from the main brake reservoir. The pantograph is then controlled by means of two electro-pneumatic valves which can be operated electrically or by hand.

In order to reduce the line voltage to one suitable for the master-controller and other control circuits,

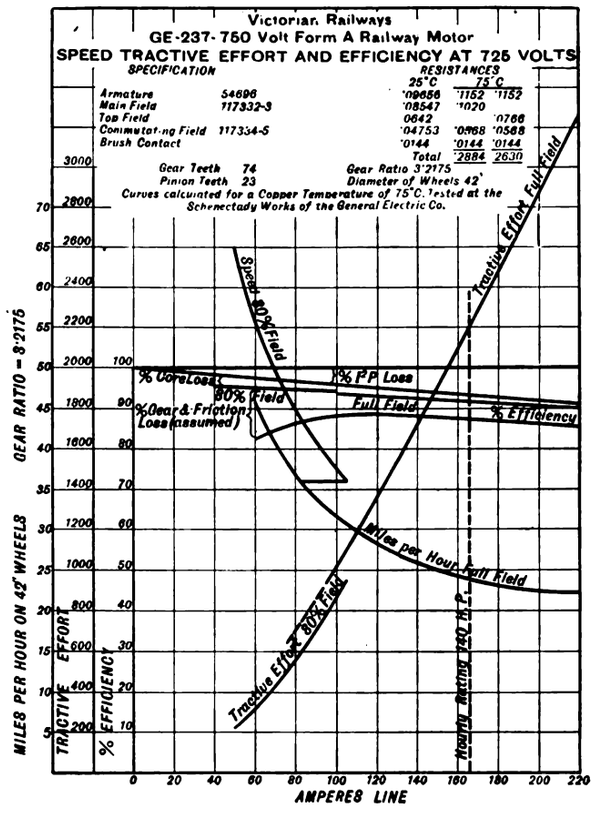
Victorian Railways
GE-237-750 Volt Form A Railway Motor
SPEED TRACTIVE EFFORT AND EFFICIENCY AT 725 VOLTS
SPECIFICATION
RESISTANCES
25°C 75°C
Armature 54696 ·09656 ·1152 ·1152
Main Field 117332-3 ·08547 ·1020 ·1020
Tap Field ·0642 ·0766 ·0766
Commutating Field 117334-5 ·04753 ·0568 ·0568
Brush Contact ·0144 ·0144 ·0144
Total ·2884 ·2630
Gear Teeth 74
Pinion Teeth 23
Gear Ratio 3·2175
Diameter of Wheels 42"
Curves calculated for a Copper Temperature of 75°C. Tested at the Schenectady Works of the General Electric Co.
Speed 80% Field
Tractive Effort Full Field
% Core Loss
% P P Loss
80% Field
% Gear & Friction Loss (assumed)
Full Field
% Efficiency
Miles per Hour Full Field
Tractive Effort 80% Field
Hourly Rating 740 H.P.
GEAR RATIO = 3·2175
MILES PER HOUR ON 42" WHEELS
TRACTIVE EFFORT
% EFFICIENCY
AMPERES LINE

Fig. 11 —Characteristic Curves for Main Train Motors.

a dynamotor is used consisting of a single field and armature with two identical armature windings and commutators.

The master-controller is of standard type, but as the actuation of the contactors is automatic, the controller only has four points in the forward direction and two in the reverse direction, the first point in either direction being known as the "switching" or "lap point," and the second point being the "series" position. The air compressor, governor, emergency, and trip valves are of usual type.

Permanent Way.

The Melbourne suburban system consists of approximately 335 track miles, including sidings. Most of the routes are double track, but those from South Yarra to Caulfield, and North Melbourne to South Kensington are four-track routes, while for three miles there is a six-track route.

The normal permanent way construction is 100 lb. per yard, T section rail, double spiked to untreated sleepers of hard wood, there being about 15 in. of blue-

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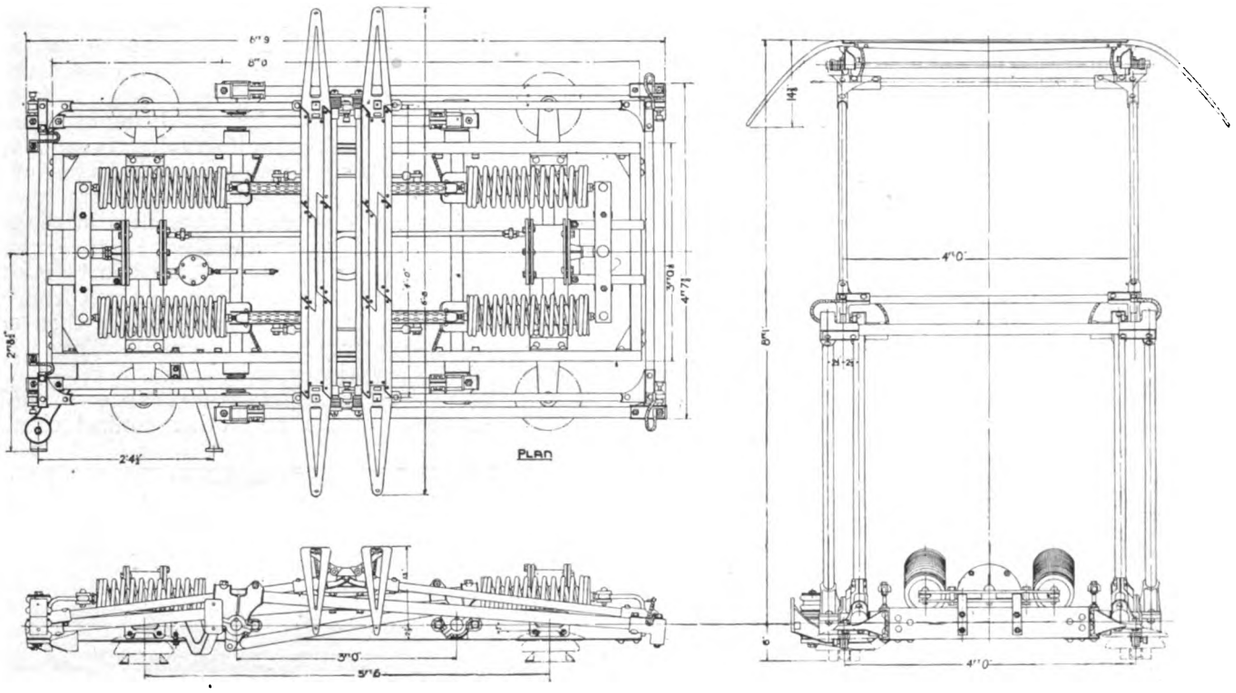

Fig. 12.—Sliding Pantograph on Melbourne Suburban Railways.

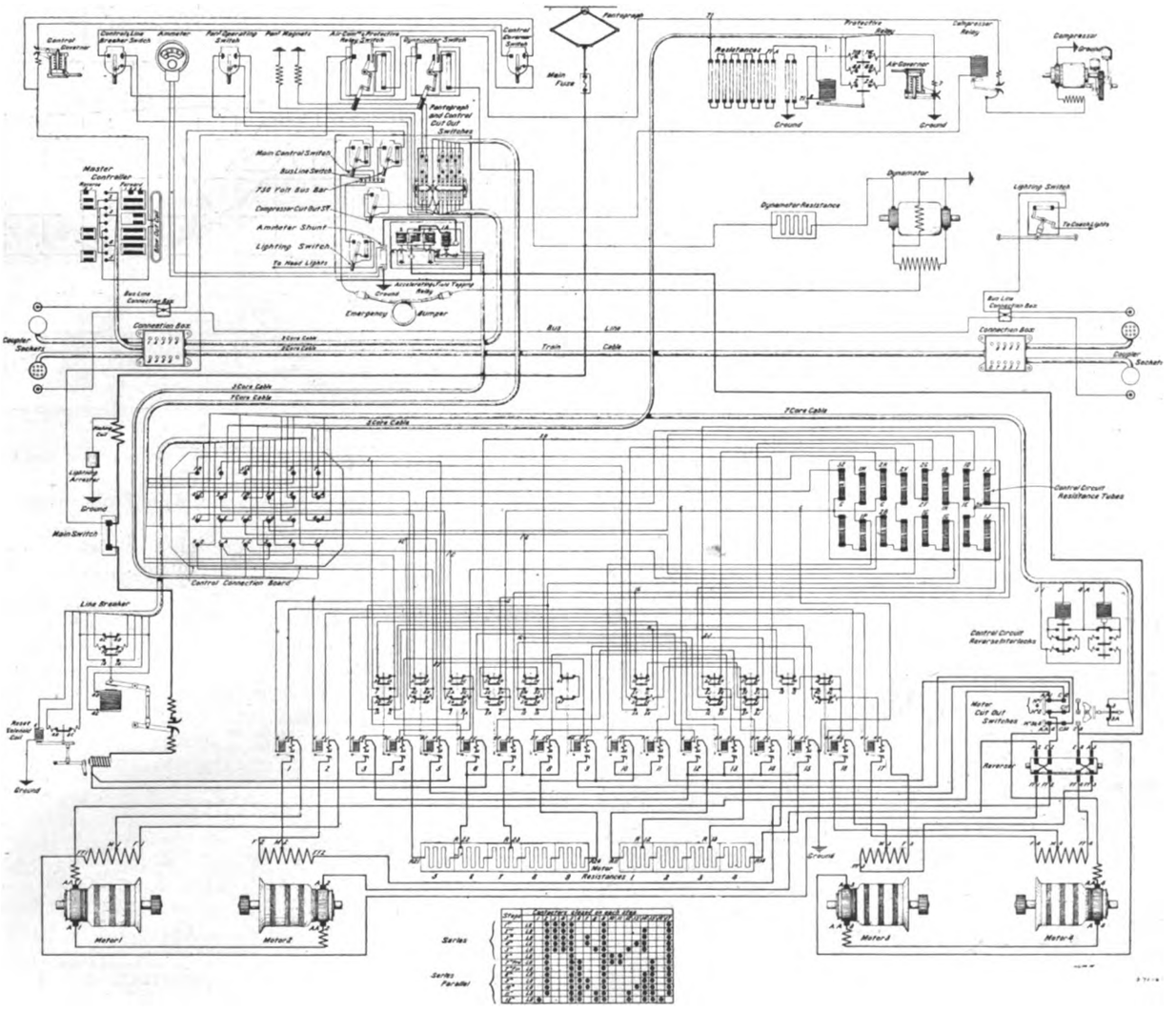

Fig. 13.—Diagram of Wiring of Electric Motor Coach.

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stone ballast. The track gauge is 5 ft. 3 in. with 11 ft. 8 in. centres, while minimum structure clearance above platform level on tangent track is 7 ft. from track centre, increased to 8 ft. on 12-chain curves. The minimum curve is 9 chains radius, while the maximum grade of any importance is one of 2 per cent. For nine miles between North Melbourne and Broad Meadows the average grade is ·85 per cent., the maximum permissible speed on this section being 52 miles per hour. Practically all curves have a 150-ft. easement approach.

Overhead Equipment.

The equipment of the track with overhead contact wires for operation at 1,500 volts was designed to provide the advantages of a flexible construction which would secure the best conditions for current collection by the pantographs on the trains, and to maintain the total copper section required per track without auxiliary feeder cables.

The number of conductors was kept at a minimum in order to avoid interference with signals, only one catenary wire and one contact wire being employed over each track.

The supporting droppers between the catenary cable and contact wire are terminated at the lower end by a short length of chain, so that the tendency of the contact wires to lift under the upward pressure of passing pantographs is not restricted by the weight of the dropper or of the catenary cable to which it is attached at the upper end (Fig. 7).

The normal construction on main suburban tracks provides for ·25 sq. in. hard-drawn grooved-copper contact wire, supported by flexible droppers at intervals of 15 ft. from a stranded hard-drawn copper cable of ·25 or ·375 sq. in. There is thus a minimum equivalent of ·5 sq. in. section of copper over each track. The contact wire is automatically tensioned at each end of each 3,000 ft. length to approximately 2,500 lb., and is anchored near the centre of every such length. The catenary wire normally has a 10 ft. 9 in. sag at the centre of a 300 ft. span at 60° F., with a minimum tension of approximately 3,200 lb.

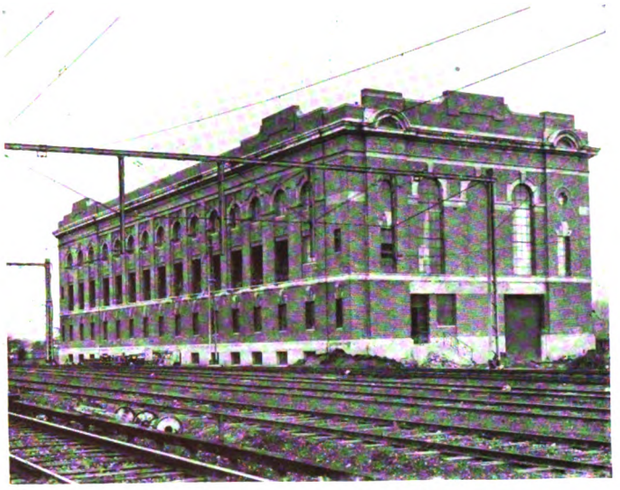

Fig. 16.—A Sub-station Building.

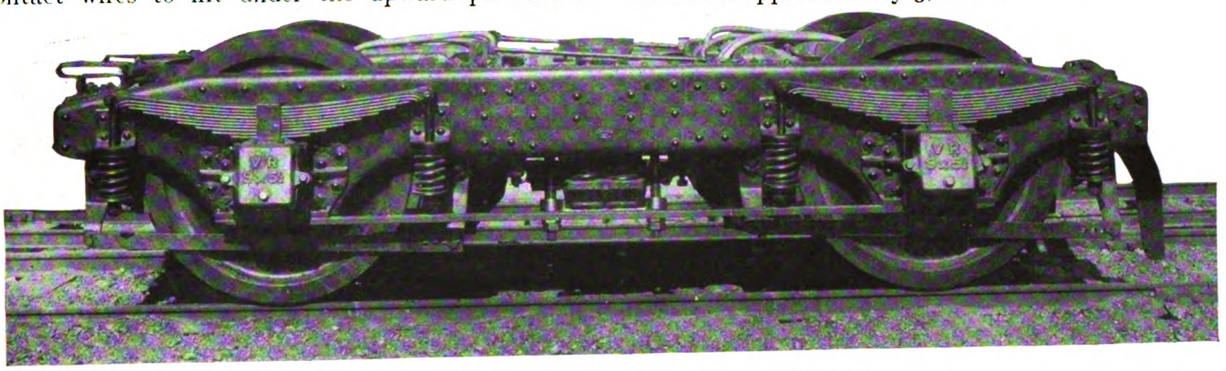

Fig. 14.—Electric Truck Equipped with Two Motors.

Fig. 15.—Method of Supporting Wires under Bridge.

The normal contact wire height is 16 ft. 6 in. over the main suburban tracks at 70° F., but over grade crossings the minimum height is 18 ft., while under low bridges, which are numerous, the minimum height is 14 ft. 6 in. above rail level, giving a vertical clearance of 12 in. between the contact wire collecting surface and the bridge (Fig. 15). As the maximum height of the projecting ventilators on the country rolling stock is 14 ft. 2 in., considerable care had to be exercised in erection to preserve the clearances provided in the diagram. The standard contact wire suspension is maintained, but beneath low bridges, and to ensure that the pantograph would not raise the contact wire more than two inches, a maximum grade of 1 in 150 was adopted for the line, and where possible a grade of 1 in 250, except where speeds were limited. In some cases rigid droppers have also been used. The dropper connections between the catenary and contact wires were measured and cut to a special dropper table, which provides the necessary adjustments to allow for grades; the droppers were then erected in the field with practically no adjustment, and a well-aligned wire has been obtained, whose vertical movement responds uniformly to changes of temperature, the catenary wire being stressed well within its elastic limit to provide for this. The importance of this precaution will be realised with temperature limits between 27° F. and 175° F. Where a steam service is also being used, the insulators are arranged so as to avoid the direct blast of the locomotive exhaust.

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Fig. 17.—Pin Arch Structures at North Melbourne Junction (Nearest Span, 120 Feet).

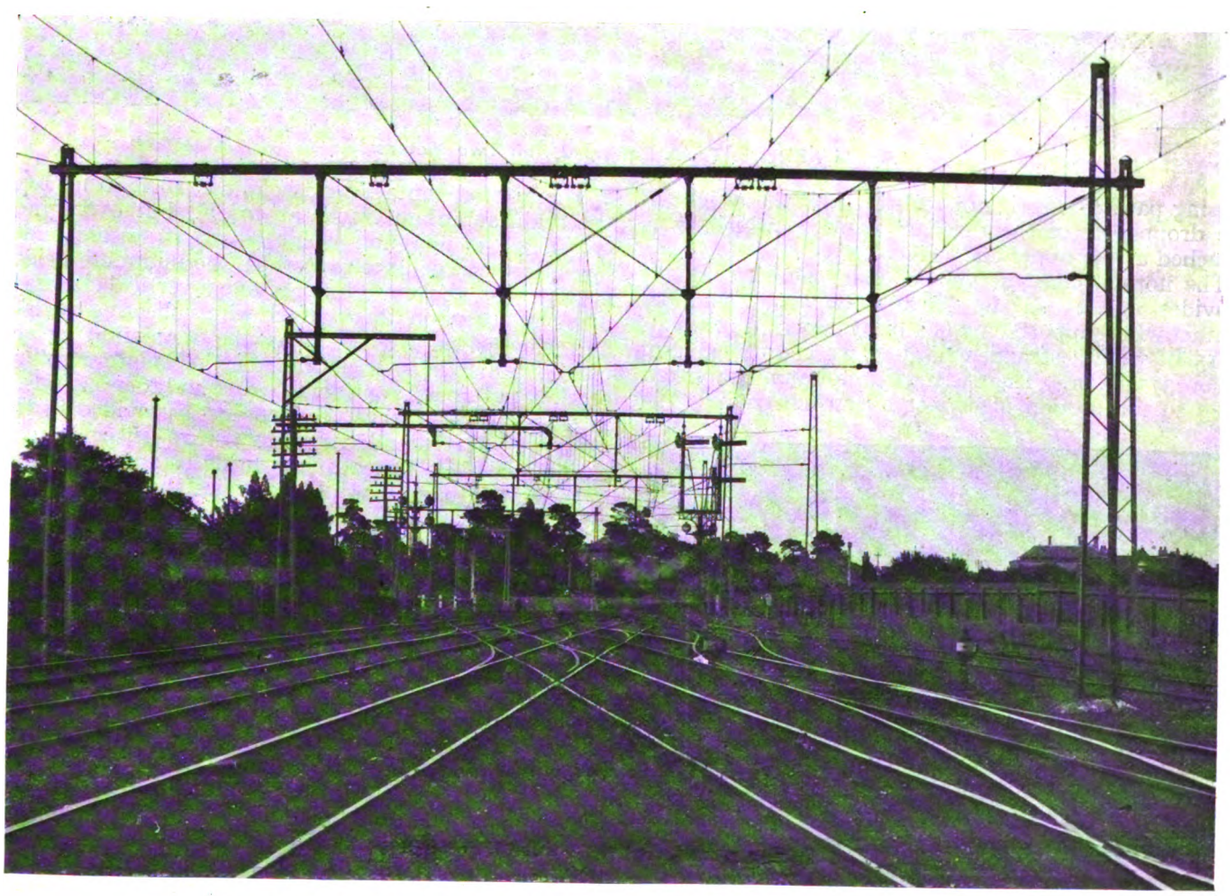

Fig. 18.—Special Overhead Work near Essendon, Melbourne Suburban Railways.

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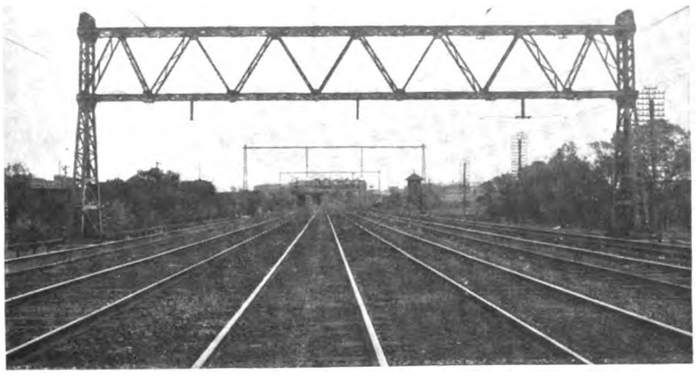

Fig. 19.—Six-Track Tensioning Structure.

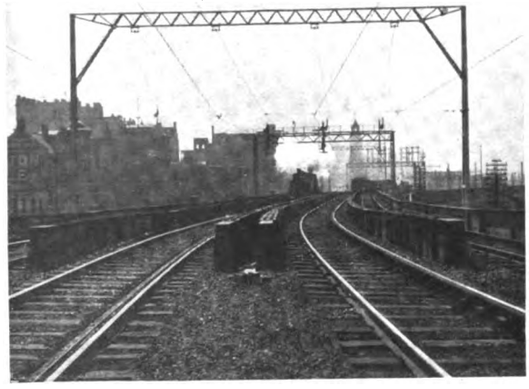

Fig. 22.—Structures on Flinders Street Viaduct.

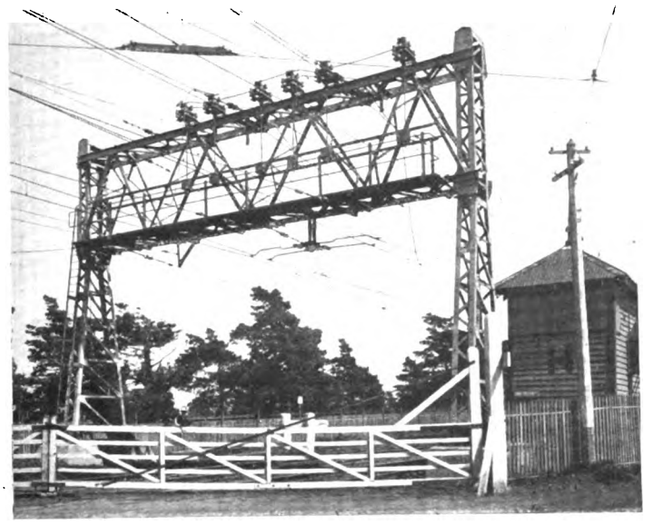

Fig. 20.—Section Switch Groups at Tramway Crossing.

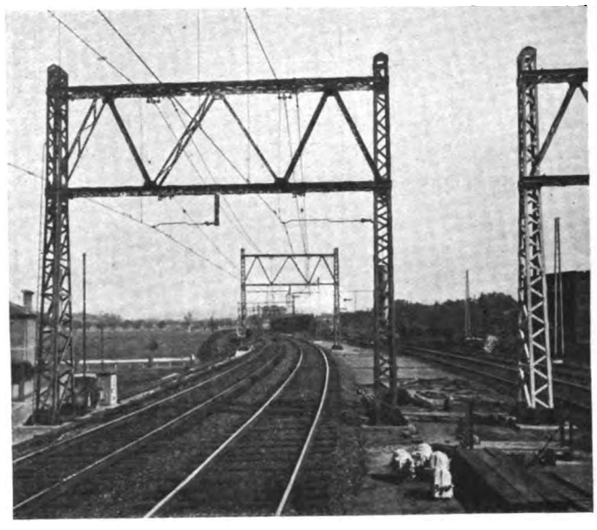

Fig. 23.—Two-Track Tension Structures at Richmond.

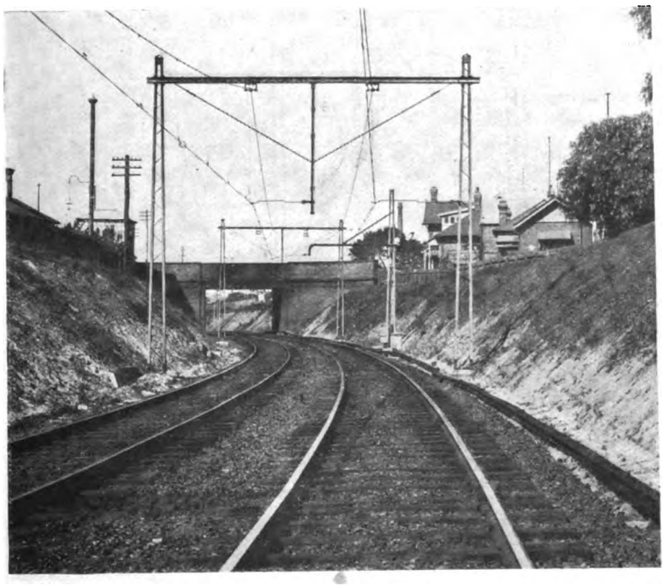

Fig. 21.—Two-Track Supporting Structure on Curve.

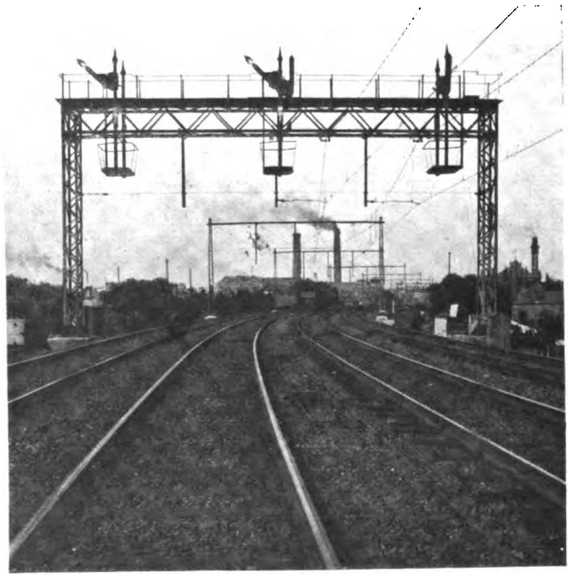

Fig. 24.—Four-Track Combination Structure on Curve.

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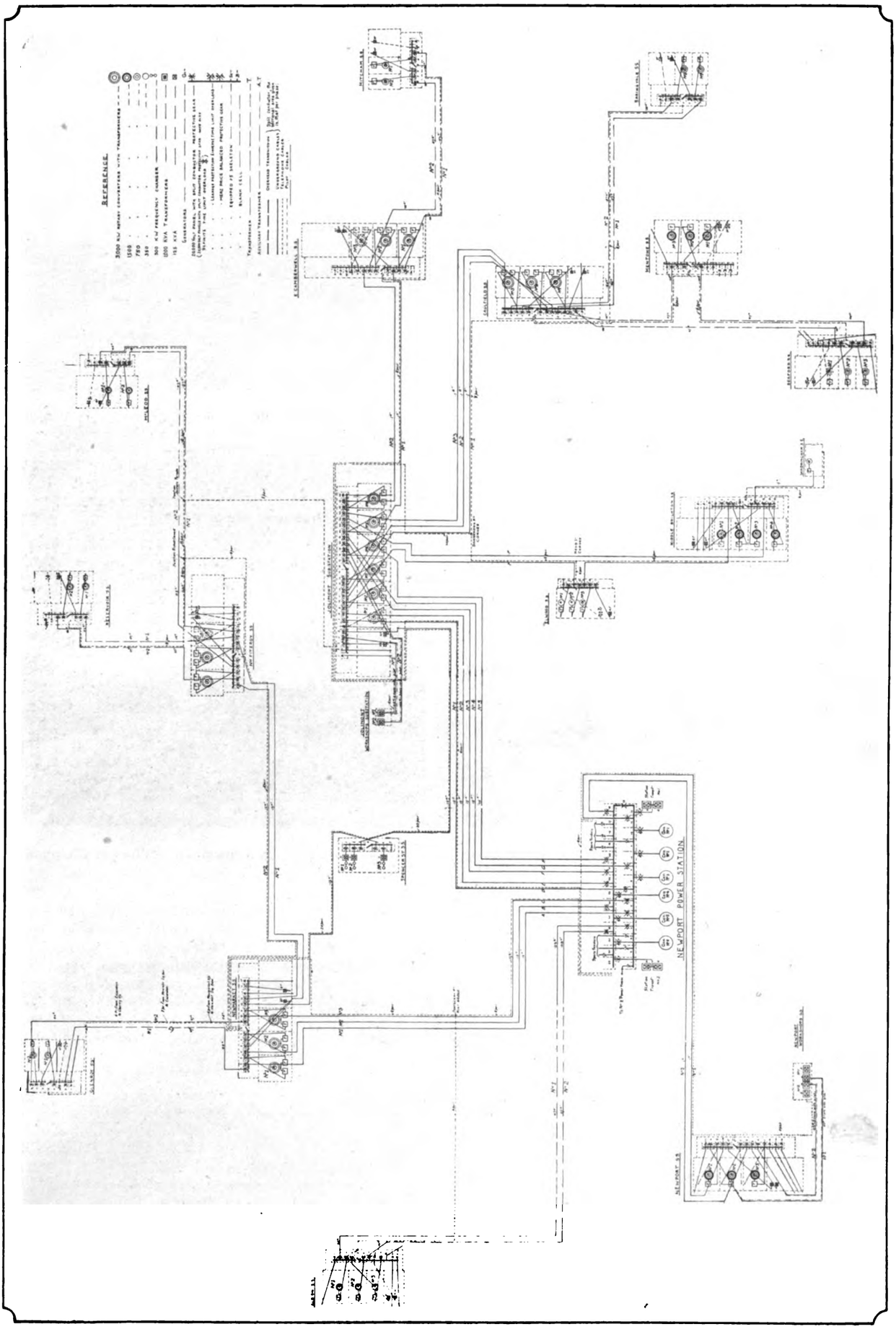

Fig. 25.—Diagram of 20,000 Volt Transmission System and Sub-stations.

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The whole of the fittings were specially designed for the equipments by the consulting engineers in conjunction with the contractors.

Supporting Structures.

The supports for the catenary construction consist of tensioning anchor structures (Figs. 18, 19 and 20), about 3,000 ft. apart, with light intermediate structures at 300 ft. intervals, on the straight track, and closer on curves. Fig. 21 shows the supporting structures on a curve. Fig. 19 shows anchor tensioning structures for six tracks and also a six-track intermediate structure. Fig. 23 shows a pair of structures at a two-track tensioning point.

Earthing.

All overhead equipment structures, signalling bridges, and overline road bridges to which line work is attached are bonded to the track rails through a paper spark gap, ·001 thick, between two aluminium discs, so that they are normally insulated from the rails. This is necessary to limit the unbalancing of current through the impedance bonds connecting the signalling track circuits, which are operated by super-imposed alternating current. Should the insulation between the overhead wires and the supporting structures break down, the spark gap punctures and the structure is connected to the nearest rail until the fault is corrected.

Special Construction.

The standard intermediate structures have been designed and adapted to carry, where possible, the single arm power operated signals. Fig. 24 shows a combined four-track signal structure; Fig. 17 shows five pin-arch structures spanning up to 120 ft. and carrying the overhead equipment load of 13 tracks on an 18 chain curve. They are also designed to carry a distributed signal load of about six tons. Fig. 22 shows special four-track construction on Flinders Street Viaduct, arranged to take up a minimum of cross track space, due to the limited clearance between the viaduct and certain adjacent buildings. Figs. 18 and 20 give a good idea of special wiring, it being noted that no contact wires are crossed at the pantograph running level.

Sectioning and Insulation.

The up and down tracks of all routes can be electrically insulated from each other, and all routes are as far as possible separately fed. At extensive junctions the overhead wires of a number of tracks are connected together and treated as one section, and are usually tensioned at both ends. An air section insulator is employed between track sections where the running speed exceeds 25 miles per hour. Over cross-overs and leading-in tracks to sidings where train speed is restricted the tracks are electrically insulated from each other by means of section insulators in the catenary and contact wires.

Sectioning points are located with reference to traffic requirements and the position of cross-overs, being on the outlying lines from two to three miles apart. The system, as a whole, is divided into sections which extend beyond sub-stations, and which are divided into sub-sections, while sidings and terminal tracks leading from the sub-sections are divided into branch sections. There is a very complete system of track circuiting and electric signalling. On the ends of the sleepers opposite "stop" signals are installed automatic train stops operated through gearing by small induction motors (Fig. 26).

Sub-stations.

The position of the sub-stations is shown in the diagram, Fig. 2. The method of feeding and interconnecting these with the 20,000 volt system is shown in Fig. 25. Fifteen railway traction sub-stations are being provided, and there are in addition two tramway sub-stations—one at Elwood for supplying the St. Kilda-Brighton electric tramways, and the other at Sandringham for supplying the Sandringham-Blackrock tramway. At Spencer Street a sub-station is also being built to take over the supply of lighting to Flinders Street, Spencer Street, and other stations, as well as to supply the State Government offices and power to the railway workshops. There are two static sub-stations—one at Newport workshops, and one at Jolimont workshops.

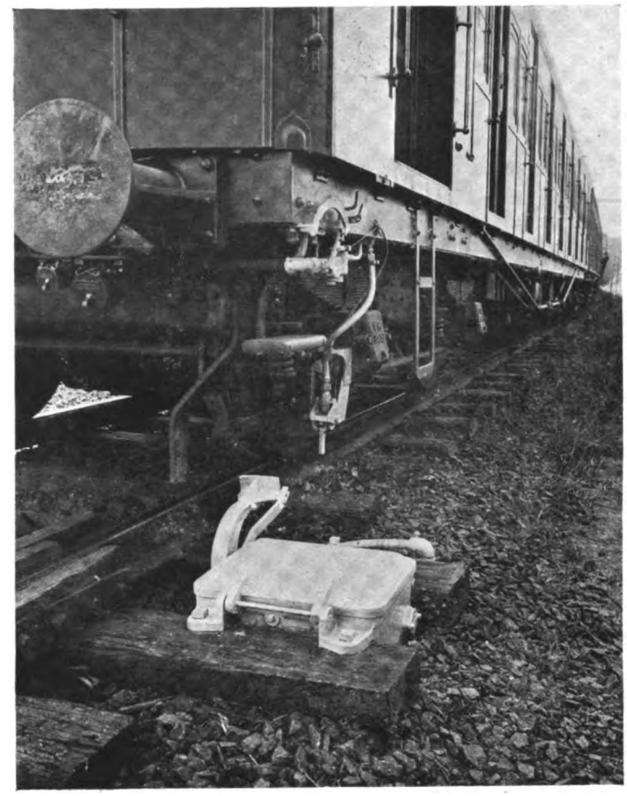

Fig 26.—Automatic Train Stop.

The sub-station buildings are of brick, with flat concrete roofs covered with malthoid. Special attention has been paid to the ventilation, numerous large screened openings being provided in the basement and vertical louvres above the roof level. Each traction sub-station building consists of two or more bays for the rotaries, with an unloading bay, and the larger sub-stations have a bay for signalling equipment, the switch house and operating gallery being in an annexe to the main building. Each rotary is installed in a separate compartment, so that during the starting up and operation of any particular rotary the chamber is screened off, the locking gear on the entrance gate being interconnected with the 20,000-volt switches controlling the supply to the rotary static transformers, and also with the operating levers controlling the 1,500-volt direct-current gear, so that it is impossible for an operator to come into contact with live metal.

High-tension Switchgear.

The 20,000-volt switchgear is of the cellular type, the cells being constructed of brick and the cell doors are completely interlocked with the main oil switches and isolating switches, so that access cannot be obtained to live conductors. The switchgear is arranged on three floors. On the ground floor are installed the cable terminal boxes, earthing and isolating switches,

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and instrument transformers; on the first floor are installed the oil switches, which are of large breaking capacity, each unit consisting of three single-phase switches in strong steel tanks. The whole connections in the oil-switch cell are insulated and the doors to the cell are dust tight. The gallery giving access to the switch cells is open to the outer air, so that in the event of a fire occurring in one switch cell, it can be dealt with from the outside. The oil-switch tanks are provided with vent pipes which discharge the gases formed when opening circuit into the open gallery; on the second floor are the busbars and busbar isolating switches. These busbars are split by means of a section switch, so that maintenance work and repairs can be carried out without shutting down the whole of the sub-station. The operating gear for the 20,000-volt switches and isolating switches is in the operating gallery, which is in front of the oil-switch cells.

Direct-current Traction Switchgear.

The 1,500-volt direct-current switchgear and the positive busbar are installed on the ground floor below the operating gallery, and all isolating switches and circuit breakers are operated by signal levers from the operating gallery above. The switchgear is mounted in brick cells with the automatic circuit breakers on the top. The chamber containing the switchgear and circuit breakers is specially ventilated. The negative and equaliser busbars are run in the basement below the rotary converters.

Signalling and Auxiliary Switchgear.

The 2,200-volt single-phase signalling switchgear is of the Reyrolle armour-clad type, specially developed for the purpose. It is installed on the operating gallery.

The 440-volt switchgear for controlling the auxiliary and signalling supplies is of the Metropolitan-Vickers ironclad type, and is mounted on the gallery above the auxiliary transformers, in one bay of the main building. The 110-volt direct-current switchgear for controlling the lighting motor generators, the tripping and operating battery, etc., is of the usual slate-panel type, and is mounted upon the operating gallery.

Rotary Converters.

Four sizes of rotary converter have been installed temporarily, made by Siemens Brothers Dynamo Works, Limited, the British Westinghouse Electric and Manufacturing Company, Limited, now the Metropolitan Vickers Electrical Company, Limited, and by the General Electric Company (of New York), the two hour ratings being 3,000 KW., 2,250 KW., 1,500 KW., and 750 KW. The 750 KW. machines, being destined for installation in outlying sub-stations with a comparatively infrequent train service, have been specially designed with a drooping characteristic, since the overloads are relatively more severe and the regulation of less importance.

The conditions laid down were the conversion of three-phase current at 19,000 volts 25 cycles into direct current at 1,500 volts, with a leading power factor of ·95 at normal load. A compound winding on the larger sizes compensates for a drop in pressure of 10 per cent. at double full load.

The machines are six-phase with 12, 6, or 4 poles. They are arranged for self-synchronising. The 3,000-KW. machines are designed to carry 6,000 KW. for short periods and *pro rata* in the case of the other sizes, except in that of the 750-KW. machines, which are designed to carry 2,000 KW. for short periods.

Distribution System—20,000-volt Transmission.

Thirteen 20,000-volt feeders radiating from the Newport power house to the sub-stations in the central area are included in the present scheme, nine being of ·15 sq. in. and four of ·1 sq. in. cross sectional area. Paper insulated, lead covered, wire armoured cables are employed, all of the split conductor type. The cables are mainly laid in trenches in the streets, owing to the very limited space available alongside the railway lines.

The trench averages 4 ft. in depth, and the cable centres are 1 ft. 9 in. apart and covered by boards. Special precautions are taken in the cast-iron joint boxes to prevent air-pocket formation when being filled with compound.

In the outlying districts the supply to the sub-stations is provided by overhead transmission on the track equipment structures. The overhead transmission lines are carried on brackets extending from the sides of the masts away from the tracks, the three phases, each of two separate wires of 0·35 sq. in. cross sectional area, being placed directly above one another and supported on chain type insulators. This enables the Merz-Hunter split conductor protection device to be employed throughout the E.H.T. transmission system. Telephone cables are laid along the route of the 20,000-volt transmission, there being an automatic telephone exchange at Jolimont sub-station for 50 lines. This provides communication between the control room, all sub-stations, and certain important signal boxes from which switching of the overhead contact wires is regulated. Such 1,500-volt direct-current feeders as are employed are paper insulated, lead covered, and for the most part wire armoured, being of ·75 sq. in. and in a few cases ·5 sq. in. sectional area.

The whole of the electrification, including the power station, has been carried out to the plans and specifications of Messrs. Merz and McLellan, consulting engineers, Westminster, under the direct supervision of their local representative, Mr. E. P. Grove, at their Melbourne offices, in conjunction with the Electrification Committee of the Railways Department.

The excavations, foundations, plaster walls, and brick buildings were carried out by the Victorian Railways staff.

Principal Contractors.

The principal contractors and their sub-contractors for the electrification scheme were as follows—

Babcock and Wilcox, Limited.
Power station buildings, complete boiler house equipment and other plant, steam and water piping, and circulating water screens.

Chief Sub-Contractors.

Heenan and Froude, Limited ...	Structural steelwork.
Davidson and Company, Limited ...	Fans.
G. and J. Weir, Limited	Pumps.
Worthington-Simpson, Limited ...	
The Nicholls Pump and Engineering Company, Limited	
British Westinghouse Electric and Manufacturing Company, Limited...	Motors.
E. Green and Son, Limited	Economisers.
Sturtevant Engineering Company, Limited	Ash Exhausters.

C. A. Parsons and Company, Limited.
Turbo-alternators and transformers.

Sub-Contractors.

British Westinghouse Electric and Manufacturing Company, Limited	Transformers.
Sturtevant Engineering Company, Limited	Air Filters.

G. Weymouth Proprietary, Limited, Melbourne.
Condensing plant, hotwells, circulating pumps, sump pumps, air and water extraction pumps.

Sub-Contractors.

The Contraflo Condenser and Kinetic Air Pump Company, Limited ...	Portions of condensers

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Siemens Brothers Dynamo Works, Limited.
Rotary converters, transformers and accessories for traction sub-stations, and switchgear and accessories for power station and sub-stations.

SUB-CONTRACTORS.

Siemens Bros. and Company, Limited	Cable connections, accessories and instruments.
A. Reyrolle and Company, Limited ...	Current and potential transformers, and protective relays.
The Tudor Accumulator Company, Limited	Secondary batteries for main power station and for sub-stations.

British Westinghouse Electric and Manufacturing Company, Limited (now The Metropolitan-Vickers Electrical Company, Limited).
Rotary converters, frequency changers, switchgear, and transformers.

General Electric Company (of New York).
Rotary converters and accessories.

A. Reyrolle and Company, Limited.
Sub-stations switchgear, also track feed boxes and transformers for automatic signalling.

Herbert Morris, Limited.
Sub-station cranes and lifting tackle for power station transformers.

SUB-CONTRACTOR.

J. H. Holmes and Company ...	Motors.

Chambers, Scott and Company, Limited.
Car shed cranes.

SUB-CONTRACTOR.

British Westinghouse Electric and Manufacturing Company, Limited...	Motors.

British Insulated and Helsby Cables, Limited.
20,000 volt and 1,500 volt cables and telephone system.

SUB-CONTRACTOR.

Automatic Telephone Manufacturing Company, Limited	Telephone installation, excluding cables.

British Insulated and Helsby Cables, Limited.
Equipment of the permanent way with 1,500 volt overhead contact wire and bonds for the running rails, including the design of the necessary steel structures which were, however, manufactured by the Railway Commissioners or local firms.

General Electric Company (of New York).
Train equipments.

SUB-CONTRACTOR.

British Thomson-Houston Company, Limited	Specified portions.

J. H. Holmes and Company.
Workshop motors and accessories.

Ferranti, Limited.
Transformers for automatic signalling and for power.

McKenzie, Holland and Westinghouse Power Signal Company, Limited
Track resistances for automatic signalling.

British Power Railway Signal Company, Limited.
Impedance bonds, relays and signal machines for automatic signalling.

SUB-CONTRACTOR.

General Railway Signal Company ...	Apparatus.

General Railway Signal Company.
Train stops, signals, relays, transformers, and other signalling apparatus.

Victorian Railways Signal Shops.
Victorian Railways Metropolitan Shops.
Gray Brothers, Williamstown.
Johns and Waygood, South Melbourne.
A. Challingsworth, Proprietary Limited, Richmond.
Cowley's Works, Ballarat.
State Shipbuilding Yard, Williamstown.
Forman and Company, South Melbourne.
Manufacture of steel structures required for the overhead equipment of the railway tracks. The raw material was supplied by the Broken Hill Proprietary, Limited, whilst the erection was carried out by the Ways and Works Branch of the railways.

The Victorian Railways Ways and Works Branch in addition to the above, carried out the main power station foundation work and the cement plaster walls and switch house. They have also built a number of sub-stations, whilst a few have been built by local contractors.

TABULATED DETAILS OF THE PLANT.

The following are details set out in tabulated form of plant and equipment—

BOILERS AND ECONOMISERS.

Type of boiler	Babcock and Wilcox—Marine.
Type of economiser	Green's.
Number of boilers and economisers	24 of each.
Type of stoker	Close link chain grate
Heating surface per boiler ...	6,725 sq. ft.
Heating surface per superheat ...	1,043 sq. ft.
Grate area per superheat ...	168 sq. ft.
Heating surface per economiser...	2,880 sq. ft.
Pressure	210 lbs. per sq. in.
Temperature	Superheated to 600° F.
Normal rating	30,000 lbs. of steam per hour per boiler from water supplied at 90° F., when fired with coal of calorific value ranging from 11,000–12,000 B.T.U. per lb.
Makers of power station auxiliary motors	British Westinghouse Electric and Manufacturing Company, Limited.
Number of fans and chimneys ...	12.
Type of fan	Davidson's Sirocco.
Feed Pumps	4 Nicholls (reciprocating), 30,000 gallons per hour each. 4 Weir (centrifugal), 35,000 gallons per hour each.

CRANES.

Position.	Makers of Cranes (and Motors).	
Engine room ...	Babcock and Wilcox ... (British Westinghouse)	60-ton main hoist 5-ton aux'l'y hoists
Pump house ...	,, ,,	15 ton
Fitting shop ...	,, ,,	15 ton
Screen house ...	,, ,,	7½ ton
Coal gantry cranes	,, ,,	4½ ton (2)
Transformer house	Herbert Morris, Limited (J. H. Holmes and Co.)	20 ton (6)
Sub-stations ...	,, ,,	20 ton (2) 15 ton (2) 10 ton (1)
Car shed	Chambers, Scott and Co. (British Westinghouse)	25 ton (2) 15 ton (3)

SCREENS.

Maker	Babcock and Wilcox, with Gwynne pumps.
Type	Inclined—travelling belt of screen units with cleaning water jets.
Number	4.

TURBO-ALTERNATORS (MAIN).

Number	6.
Type	Parson's reaction.
Output at ·95 lagging power factor	4—Economical outputs 10,000 KW. Maximum continuous output 12,500 KW. Maximum output for short periods, 14,000 KW. 2—Economical output, 12,500 KW. Maximum continuous output 14,000 KW. Maximum output for two hours, 15,000 KW.
Speed	1,500 revolutions per minute.
Voltage at stator terminals ...	3,300—three-phase.
Periodicity	25 cycles per second.
Makers of auxiliary motors ...	British Westinghouse Electric and Manufacturing Company, Limited.

AUXILIARY TURBO-ALTERNATORS.

Number	2.
Type	Parson's impulse reaction.
Output	350 KW.
Speed	1,500 revolutions per minute.
Voltage	440—three-phase.
Periodicity	25 cycles per second.

STEP-UP TRANSFORMERS.

Number	18 single-phase—in groups of 3
Maker	British Westinghouse, Shell type
Ratio	3,300–20,000 volts.
Output (continuous)	12,500 KW. at ·95 power factor per group of three.

UNIT TRANSFORMERS.

Number	6—three-phase.
Maker	British Westinghouse-Core type
Ratio	20,000–440 volts.
Output (continuous)	400 K.V.A.

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POWER STATION AUXILIARY TRANSFORMERS.

Number	4—three-phase.
Maker	British Westinghouse--Core type
Ratio	20,000–440 volts.
Output (continuous)	1,000 K.V.A.

GUARANTEED STEAM CONSUMPTION, INCLUDING TRANSFORMER LOSSES.

With—200 lb. per sq. in. pressure at stop valve.
Steam at 600 deg. F.
Vacuum = 1¼ in. of mercury.
Voltage = 20,000.

Load on 10,000 KW. sets—	
50 per cent. of economical output ...	13·95 lb. per KW. hour.
75 ,, ,, ...	12·65 ,, ,,
100 ,, ,, ...	12·00 ,, ,,
125 ,, ,, ...	12·30 ,, ,,
Load on 12,500 KW. sets—	
100 per cent. of economical output ...	11·35 lb. per KW. hour.

CONDENSING PLANT.

Number of condensers	6 (twin).
Type	Contraflo.
Surface of each twin condenser ...	22,000 sq. ft.
Air extraction system	Kinetic (6 sets).
Circulating pumps	6 vertical spindle, Mitchell design with Mitchell thrust bearings.
Capacity of circulating pumps ...	14,000 galls. per minute.
Makers of Motors	G. Weymouth Proprietary, Ltd.

ROTARY CONVERTERS AND TRANSFORMERS.

The following makes and sizes of rotary converters are at present in use or on order—

Maker.	Output for two hours.	Speed of Rotary.	Voltage.	Periodicity.	Phases
	KW.	R.P.M.			
Siemens Brothers Dynamo Works, Limited	3,000	250	1,500	25	6
British Westinghouse	2,250	250	1,500	25	6
General Electric Company (of New York)	2,250	500	1,500	25	6
Siemens Brothers Dynamo Works, Limited	1,500	500	1,500	25	6
,, ,, ,, ...	750	750	1,500	25	6
British Electric Transformer Company, Limited (Transformers only)	3,000 1,500 750	---	20,000 -1,050 aprox.	25	3—6

WORKSHOP MOTORS AND CONTROL PANELS.

Maker.	Number.	H.P.	Voltage	Periodicity
J. H. Holmes and Company	95	2½-125	440	25

TRAIN EQUIPMENTS.

Make up of train	Equal number of motor and trailer coaches.
Motors per motor coach	4.
System of control	Full automatic with tapped field. Control current obtained from 1,500–750 volt dynamotor.
Method of collection	Pantograph.
Weight of motor coach	47 tons average.
Weight of trailer coach	27 tons average
Gauge of track	5 ft. 3 in. Coaches and equipments are designed so that it can be reduced to 4 ft. 8½ in. in future.
Diameter of driving wheel ...	42 in. (new).
One hour rating of motor ...	140 B.H.P.
Gearing	72/23.

LONDON STREET TRAFFIC CONGESTION.

Sir Eric Geddes, replying in the House of Commons on December 22 to Sir F. Hall, said that the steps which had already been taken to reduce congestion at certain points in the London area were undoubtedly proving useful, but substantial alleviation could not be expected immediately, seeing that this period of the year was necessarily the heaviest for street traffic. The chairman of the recently appointed Advisory Committee on London Traffic was also chairman of the Select Committee on Transport (Metropolitan Area), and was therefore aware of the suggestions made by the latter committee. The Select Committee reported that the evidence they had received showed the need for certain measures, and those which were considered immediately necessary, and could be brought into effect without further legislation were being given effect to. These included better control of traffic, arrangements for stopping places for omnibuses as for tramcars, and the formation of queues.

Sir F. Hall asked whether his right hon. friend was aware that no notice had been taken of the recommendation with regard to slow-going traffic, and that that was the chief factor in the congestion in many important streets; and would he immediately take steps to bring the suggestions on that point into operation?

Sir E. Geddes.—That is a matter which is having the attention of the Committee.

Sir F. Hall.—Is the right hon. gentleman aware that although the chairman of this Advisory Committee is the same as of the Select Committee we have no tangible knowledge that anything has been done on the lines indicated? Will he take steps in the matter?

Sir E. Geddes.—The question is being considered by the Committee and by the Technical Committees which they have appointed and no single recommendation has been turned down. The whole question is being tackled as fast as inspection on the spot allows.

Lieut.-Col. Moore-Brabazon asked the Minister of Transport if he was aware of the state of traffic congestion in the West End; whether the holding up of the main arteries for the passage of cross traffic was left to the policemen or had it any co-ordinated policy which prompted it, and if so, what was that policy; was he aware that south-going traffic along Park Lane was much retarded by the arbitrary closing of Hamilton Place, and what was the reason for that; why, as there was but one gate open at Hyde Park Corner, only traffic going north should be allowed through it; was he aware that the new system of traffic regulation opposite the Houses of Parliament caused much congestion and waste of time, and would he take steps to revert to the old system; and would he appoint a committee to investigate the whole subject of street traffic with a view to advising him as to what action should be taken to get back at least to the former conditions?

Sir E. Geddes.—The first four parts of the question refer to the powers exercised by the police, and would be appropriately addressed to the Home Secretary. As regards the last two parts, the alterations in traffic control in Parliament Square are being carried out on the recommendation of the Advisory Committee on London Traffic, and an improvement in general traffic facilities is anticipated as a result of this experiment, which is being carefully watched. All matters relating to traffic congestion in London are being considered by the expert Technical Committee of the Advisory Committee on London Traffic, and it is not thought necesary to appoint another committee.

SOCIAL CLUB FOR BRADFORD EMPLOYEES.

The neucleus of a Social Club has now been formed in connection with the Bradford tramway undertaking. The movement originated among the employees, who obtained information as to what had been done in the same line by other large tramway undertakings. They sent a deputation to the general manager, Mr. R. H. Wilkinson, who informed them that he was very favourably impressed with the idea, and that he would give the scheme all the support he could. The employees moving in the matter then sent out a circular to their colleagues in which they pointed out that large social clubs already existed in connection with the tramway undertakings in various large towns, and that these clubs provided facilities for all sorts of sports. In the case of Bradford good rooms were available on the central premises. Thereafter a ballot of the employees was taken, when 1,100 out of a total of 1,600 voted in favour of the project, and expressed their willingness to contribute towards the maintenance of the club.

The next step was that the Tramways Committee received a deputation, comprising members of the Provisional Committee of the Social Club, and gave them an assurance of assistance in the formation of a Social and Athletic Club if one were formed. They also promised to provide rooms—previously occupied by the women conductors—free, furnish and decorate them, and pay the expenses of curators, who will, in all probability, be ex-service men who have been disabled.

It is proposed to fit the rooms up for billiards and for café, lounge and reading rooms, etc., and it is hoped that all employees will take an interest in the venture. In addition there will be outdoor sports, such as cricket, football, etc. The club is to be run by the men themselves, in consultation with the general manager.

A recommendation from the Tramways Committee has now passed the Council, and the work of preparing the rooms is in progress. It is hoped that these will be available for occupation in the course of the next few weeks. A general meeting was called in December, when officers were elected, Mr. Wilkinson being chosen hon. president.

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A NEW PETROL-DRIVEN TRAMCAR.

There can be no question that the possibilities of the application of the internal combustion engine to tramway car operation have by no means been exhausted. With the high cost of material and labour it becomes essential that any system that promises cheap and efficient transport should be carefully considered, for while the need for increased facilities is apparent in all directions, the cost both of installation and operation of the heavier type of rail cars must necessarily restrict their use to districts where comparatively heavy traffic is assured. Much has already been said in favour of the petrol-driven tramcar, and the details which we have published from time to time of the running cost of those in operation have testified to the economy of the system and also to its efficiency. When the question of initial cost is also taken into consideration there appears to be strong arguments in favour of their use in suitable conditions.

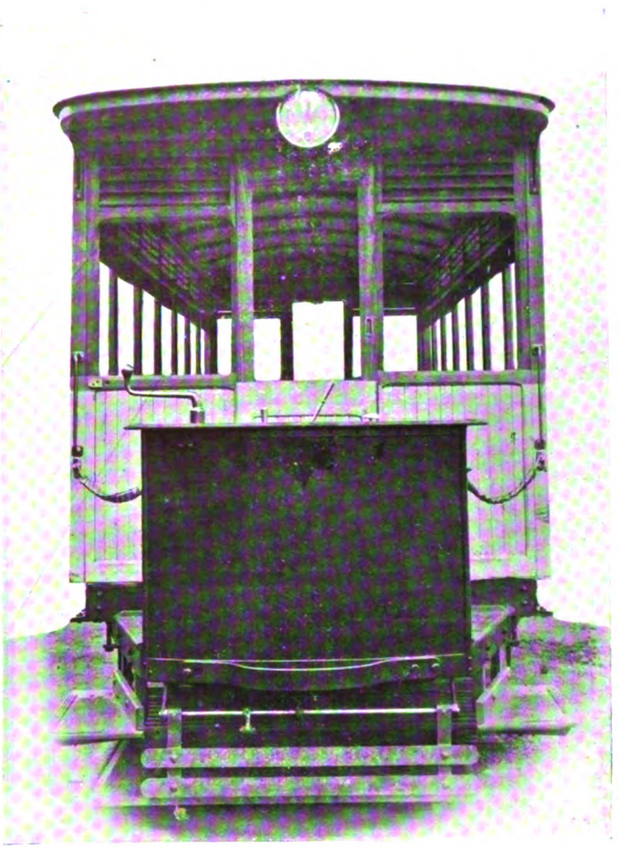
The latest type of the petrol-driven tramway car is shown in the accompanying illustrations. The car has been designed and built by the Motor Rail and Tramcar Company, of Bedford, and is the first of a new fleet of cars recently ordered by the East India Tramway Company to re-equip the present system in Karachi, which, like other concerns similarly placed, suffered severely through lack of renewals during the war.

The new car has a seating capacity of 38 passengers, and from previous experience in the running of similar vehicles the makers do not anticipate a greater petrol consumption than one gallon per eight miles. On a trial trip at the company's works, where the new cars have been constructed, the steady and even running of the engine, and the comparative absence of vibration, together with the rapidity of acceleration, were notable, as was also the ease with which the car could be controlled both as regards speeds and braking.

The engine, which is incorporated in the underframe amidships, is of 40 B.H.P., and is specially designed for the purpose of giving great flexibility as regards varying speeds and loads. The drive is taken through a patent two-speed (both directions) gear-box to the four wheels by heavy roller chains.

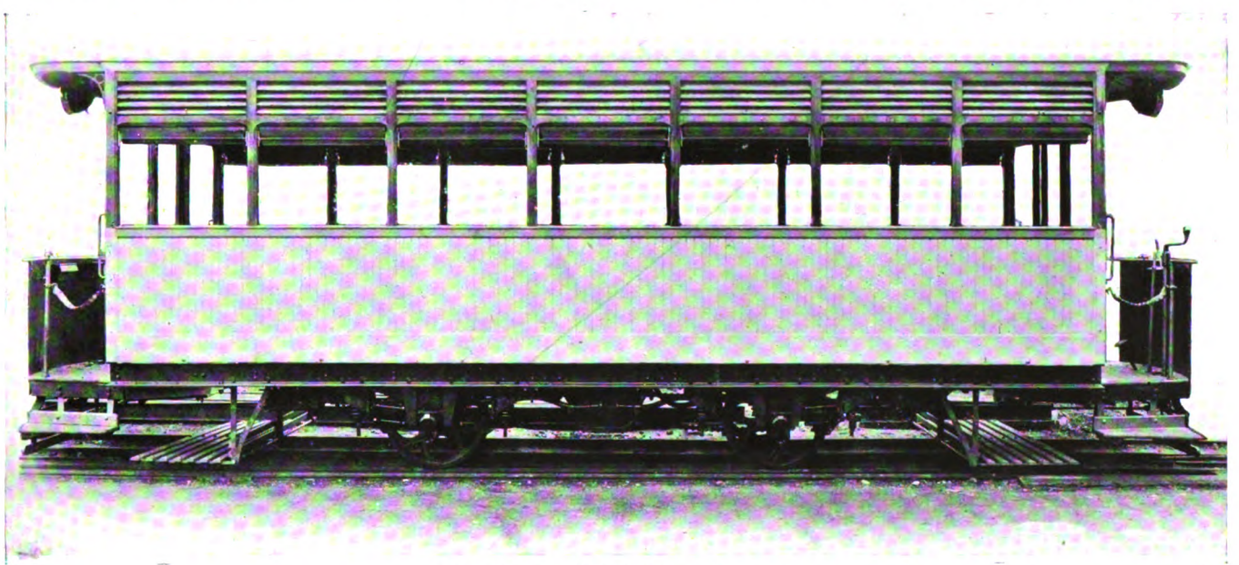
The car can be driven from either end, being provided with controls which can be removed from one end to the other, thereby preventing interference with the control mechanism on the rear platform.

As will be seen from our illustrations, the body and general seating arrangement is very pleasing, and the car generally conforms to all up-to-date requirements. Internal electric lights as well as electric head lights are provided and supplied from a dynamo, the equipment being supplied by the C. A. Vandervell Company.



Front View Showing Control Lever.

The general specification of the car illustrated is as follows :—Overall length, 26 ft. 6 in.; overall width, 6 ft. 9 in.; height overall, 9 ft. 4½ in.; height of car platform from rail, 2 ft. 7½ in.; wheel base, 7 ft. 6 in.; wheel diameter, 2 ft. 3 in.; gauge, 4 ft.; approximate weight, 8 tons.



The Simplex Petrol-driven Tramcar.

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The engine is the " Dorman " 40-H.P. 4-cylinder type. All bearings are of liberal dimensions, and provided with automatic lubrication from a geared oil pump, the oil being constantly passed through oil filters, oil level indicators and large oil filling apertures being provided. Ignition is by means of H.T. magneto provided with advance lever. Adjustable poppet valves of the interchangeable variety are fitted.

The water-cooling system is operated by means of a centrifugal pump, driven off the engine, the radiators being placed underneath the car. A water compensating tank is also provided to ensure efficient cooling under all conditions. The clutch is of the inverted cone type, specially constructed, and housed in a large diameter flywheel the more readily to overcome starting inertia. It is provided with adjustments and also back stop spring to facilitate gear changing. The " Dixon-Abbott " patent change-speed gear provides two speeds in both directions. The whole gear box is completely enclosed, the gears running in oil. The shafts are mounted on ball bearings properly housed, and the gears are of high-grade steel carefully hardened and ground. Heavy roller chains take the final drive to the axle, provision being made for adjustment.

The underframe is built up of channel section steel, well cleated and gussetted. The springs are of the flat railway type, combined with spiral compression springs, and provide easy riding at all speeds. Toughened cast steel wheels of a special section are provided, these being pressed on to the steel axles by hydraulic pressure.

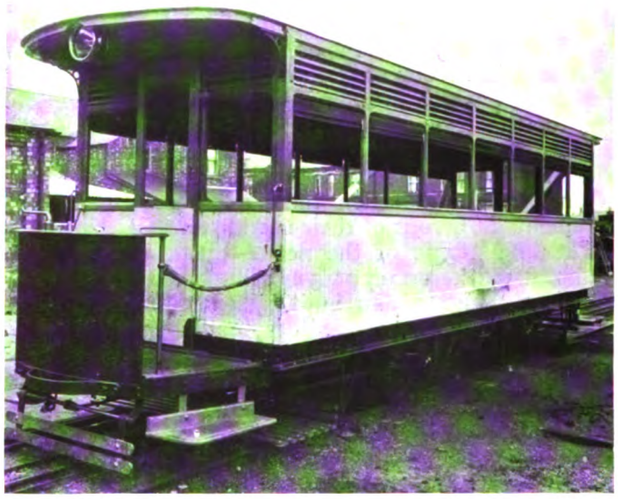
Standard type car brake gear is fitted ; this operates four large area cast-iron blocks, one to each wheel. The malleable cast-iron axle-boxes are fitted with gun-metal bearings arranged for oil lubrication, dust shields being provided.

The control levers are arranged conveniently for use by the driver standing at either end of the car for driving in either direction. The levers fit into sockets, and are removable, so that the rear control cannot be tampered with in the absence of the driver. The car body has been specially designed for service in India ;

Interior View Showing Seating Arrangement.

it is built up of ash framing with pitch pine panels, giving the maximum rigidity combined with lightness. The side panelling runs the full length of the car, the exits being by the driving platform at either end, both sides of which are open. It is thus possible for passengers to enter at the rear and pass out by the front, both on the near side of the car. Each entrance to the interior of the car is provided with half-glass sliding doors, the end partitions being also provided with windows. Sun blinds only are provided at the sides. All the seats are of the cross variety.

Easy access to the engine is given by means of a movable panel in the side of the car ; this can be raised from the outside when any minor adjustment found necessary can be made without disturbing the passengers. For more extensive overhauling or replacement the entire casing of the engine can be removed in



View Showing Entrance to Interior.

a few moments, as also sections of the floor of the car, thus disclosing the gear box, clutch, driving chains, etc.

The usual foot gong and stopping and starting bell are provided, together with the necessary switches for controlling the lighting equipment.

The speed of the car when fully loaded has been determined at 15 miles per hour, in either direction.

A SUPER POWER STATION IN BAVARIA.

Work has just been begun on a great hydro-electric generating station to utilise the water power of Lake Walchen. The lake is to serve as a regulating reservoir, and will be supplied by a tunnel connecting with a branch of the River Isaar. The exit is to consist of a partly submerged canal leading to tanks from which descend six conduits, each of 1 metre diameter. The fall is 200 metres.

Current will be distributed at 100,000 volts to a dozen or so main sub-stations, which will reduce it to 25,000 or 50,000 volts. These sub-stations will be located in the principal towns in the region, and the area supplied will extend to a distance of 280 miles from the generating station. The high tension feeders are of aluminium with a cross-section of 120 sq. mm., and will be carried on steel poles 25 metres high above ground.

When the work is completed it is expected that 80 per cent. of the total energy consumed in this region of Bavaria will be derived from water power. The station at Walchen is being constructed by the State, and the cost of distribution will be shared between the State, the principal towns, and industrial enterprises interested.

A Commonsense View of Tramway Extension.—It is so seldom that writers in general newspapers are able to contemplate the subject of tramway extensions in a commonsense way that it is gratifying to find a writer in *Truth* affirming that he has an open mind on the subject. " There are," he remarks, " roads and localities where electric cars are suitable. The extension of tramways in London should not, however, be attempted without a most thorough inquiry by traffic experts "—a suggestion with which we are in thorough agreement. Unfortunately few experts are impartial, and however excellent the intentions of members of Private Bill Committees, it is not to them that one looks for expert knowledge of street locomotion. As we have so often urged, tramways, railless trolley cars, and omnibuses have their own distinctive advantages for certain conditions, and their suitable uses. The one thing necessary is to study closely the particular conditions that have to be met, and then to determine without prejudice or passion the best means to use in particular cases.

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DISTRICT RAILWAY IMPROVEMENTS.

SHORTENING THE STATION STOPS.

In the closing days of December and in the opening days of the New Year travellers in London were much interested in a new experiment which the Metropolitan District Railway Company inaugurated at Victoria Station, one of the busiest stations on their line. The object in view was to reduce the duration of the stoppages of trains at the station during the busy hours of the morning and evening, so that the traffic might be conducted more expeditiously. For this purpose an official of the company is mounted in a high box on the platform from which he can survey the whole scene. He is provided with a stop-watch, and a syren is mounted close by. If a train fails to get away from the station within 30 seconds from its time of arrival, the official sounds the syren. Then comes the hustle, with an augmented platform staff, to get all passengers out of and into the train, to have the doors shut, and to give the "right away." This course of operations is carried out on the east-bound platform between eight and ten o'clock in the morning, and on the west-bound platform between five and seven o'clock in the evening.

On January 9 representatives of the press were invited to attend at the offices of the railway company at Westminster to hear an account of experiences with the system, and it may be said at once that these are very favourable. The public have already acquired the habit of keeping clear of the trains immediately the syren blows. There has been a saving of 30 per cent. in the time of train stoppages at the station as compared with the days before the train controller came on the scene. There is also a material reduction of checking or stopping trains in the tunnels, because when a train is unduly delayed at the station bunching of the following trains ensues. This is the more evident when it is remembered that the average interval between trains during the busy hours is only about 1½ minutes.

Mr. J. A. Thornton, superintendent of the line, and Mr. Walter Smith, the traffic controller at Victoria Station, attended the meeting of press representatives, and gave details of the experience gained. Mr. Thornton said that the records showed that on December 2 the average duration of the train stops at Victoria Station was 48 seconds. On December 3 it was 46 seconds. On December 31, just after the "hustle" had been inaugurated, it was only 35 seconds. All these figures refer to the "rush hours." At the slack times of the day the stops are shorter. Signal checks to trains between adjoining stations have been almost eliminated. The new arrangement requires eight more of a platform staff to help to get the passengers out and in and to close the doors.

Mr. Walter Smith, who has been described as "the hurry-up man," stated that during the morning rush before the control trains frequently arrived at the Mansion House six or eight minutes late. Since the control was established the behind-time period has been reduced to a minute or a minute and a half. This is of special interest, seeing that it is the result of control at only one station. The control was also to come into operation at Charing Cross Station on January 12, when further improvement was anticipated. As illustrating the need of some such arrangement, Mr. Smith mentioned that 42,000 passengers are booked daily at Victoria, and 32,000 at Charing Cross.

It will be possible, we were informed, further to develop the equipment at Victoria by the addition of clocks automatically worked by trains when coming to rest, showing the exact number of seconds since the train came to rest. Instead of there being one large syren in the centre of the platform, two or three smaller syrens distributed along the length of the platform, and operated by an electric button by the controller, are to be tried. At quieter stations (when the system is extended) it will not be necessary to have a platform controller, as the syrens can be automatically sounded from the clock at any given time, varying with the density of traffic at the station.

It is of interest to note that the syren is worked by compressed air obtained from the automatic signalling main. It may be recalled that the operation of the signals is carried out electro-pneumatically, and that pipes conveying compressed air run the entire length of the railway.

At Victoria Station further improvements are to be carried out. A new staircase at the western end of each platform will encourage passengers to distribute themselves over the length of the trains. The new interchange subway at Charing Cross is well advanced, and it is expected to be open for use in March. These features should also help to relieve congestion.

The same remark may be made with respect to the new rolling stock, now on order, the delivery of which is expected to begin early next summer. Each new car will have three sets of double doors spaced out equally along the length of the car. The doors will be so wide that passengers will be able to leave and enter the cars at the same time. By extending the "hustling" system it will then be possible to run more trains.

An interesting table has been prepared by the underground railway authorities to show the saving in time effected by their electric railways between given points as compared with the old horse omnibus days. The following are the times for the journeys mentioned—

	Horse Omnibus.	Underground Railway.
Charing Cross and Hampstead ...	... 45 mins.	18 mins.
Charing Cross and Highgate ...	... 55 mins.	17 mins.
Piccadilly Circus and South Kensington	... 20 mins.	7½ mins.
Bank and Shepherd's Bush ...	... 45 mins.	20 mins.
Victoria and Earls Court	... 30 mins.	8 mins.
Victoria and Mansion House ...	... 40 mins.	10 mins.

COAL CONVEYING PLANT AT GREENWICH.

The coal arrangements at Greenwich power-station of the London County Council Tramways proved inadequate during the war on account of the general deterioration of the cranes and the largely increased quantities handled owing to low quality fuel being used. The difficulty has been met by employing two shifts of men, but there has been much delay in discharging. The Highways Committee consequently asked Messrs. Kennedy and Donkin, the Councils' consulting engineers, to prepare a scheme for the installation of modern plant. This provides for the provision at the pier head of two jib cranes, each capable of unloading 100 tons of coal an hour, each crane fitted with a grab to lift 30 cwt. at a time, each grab load to be dumped into a coal weigher or be weighed by some other approved means on the transporter or crane. The coal would then be fed on to belt conveyers parallel to the ship. These would feed another belt conveyer, which would deliver the coal over the outside of the coal bunker. A coal-breaking machine, also suitable for coke, would be installed at the junction of the two sets of conveyers. The scheme also provides for a travelling belt conveyer from the pier to the boiler-house bunkers. The rate at which coal could be transferred would be 200 tons an hour, thus unloading a ship in from nine to ten hours. The present cost of handling is 13·63d. per ton, as compared with an estimate under the new plant of 8·65d. a ton, or a saving of £3,358 a year. In consequence of the more expeditious unloading it is probable that the price quoted for coal deliveries may be reduced in the future. The estimated cost of the work is £33,000. To renew the existing cranes would cost £17,000. The cranes and the locomotive will be retained as a stand-by.

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THE EDITOR will be glad to consider articles by experts. All information of a practical character relating particularly to the engineering and operating branches of transportation will receive prompt attention. Original illustrations will also be welcome.

LONDON, JANUARY 15, 1920.

The Electricity Supply Act.

The Government sprang a surprise on Parliament and the country on December 16 by announcing in the House of Lords that they withdrew for the present all the compulsory powers in the Electricity (Supply) Bill for the establishment of district electricity boards and for the establishment of any generating stations and main transmission lines. They also cut out all the financial clauses except that which provides £20,000,000 for the erection of emergency power-stations and transmission lines. The part of the Bill (now an Act) which remains provides for the establishment of the Electricity Commissioners, the exercise through them of all the present powers and duties of the Board of Trade under the Electric Lighting Acts and Orders made thereunder, the power to the Commissioners to conduct experiments, and the power to set up advisory committees. The Government also announced that early next session they would reintroduce the dropped clauses of the Bill. The reason for the line of action which was announced by the Lord Chancellor was the great opposition to the general compulsory powers in the Bill, particularly in reference to district electricity boards, and the fact that the session was so near its end that there was no time for reconciling the differences likely to arise between the two Houses of Parliament on the details of the measure. Some Peers objected to the great expenditure which they said would be involved, and others appeared as the champions of private enterprise which they considered would be smothered. They scented nationalisation, and that was a strong objection. The Government denied allegations of the sort, but the shortness of time before the end of the session was the master of the situation. So the course proposed was agreed to. Mr. Shortt, the Home Secretary, speaking in the House of Commons, was very emphatic as to the determination of the Government to reintroduce the dropped proposals next session. Certainly without them or some corresponding provisions, the scheme for a national electric supply would be very incomplete. In the interval, however, as was pointed out, the Electricity Commissioners will have opportunity to do a great deal of preliminary work in exploring the general situation. If it were not for the well-known pertinacity of many members of the House of Commons it might be said that the long time which they took in discussing the details of the Bill in the past session will not be thrown away; but it is not unlikely that some of them will, when the postponed part of the Bill again comes before them, persist in again arguing at length on many points. As for the Lords, if a majority of them persevere in making serious amendments against the will of the Government, a difference will arise between the two Houses which will only be solved by compromise or by the Lords giving way. Failing that, the new Bill will be lost. It does not appear that there is any other alternative scheme for securing the abundant supply of electricity that is so much desired.

Melbourne Railways Electrification.

There is a fine comprehensive completeness about the scheme of electrification of the Melbourne suburban railways which contrasts with the piecemeal gradual conversion of the lines which enter London. The reason why the whole work could be put in hand at once is no doubt that all the railways are owned by the State. That is one advantage of State ownership, and it

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may be hoped that in this country under the ægis of the Ministry of Transport comprehensive electrification schemes may be possible without the disadvantages attaching to railway nationalisation. From the illustrated description of the Melbourne scheme which we publish in this issue, it will be seen that the lines electrified extend to 335 miles of track, representing about half the length of route. It is thus one of the most extensive schemes of the sort which has yet been carried out. The outstanding feature is that the high-tension direct-current system of traction, with overhead conductors, has been adopted. The working pressure is 1,500 volts, while the three-phase pressure for transmission to sub-stations is 20,000 volts. The highest direct-current voltage used on a railway in this country is 1,200 volts, but in America double that figure is in one or two cases employed. Before a decision was reached alternative prices were obtained for the single-phase and direct-current systems, and the latter proved to be substantially cheaper in capital cost, and was estimated also to be cheaper in operation. The indications are that the high-pressure direct-current system will be largely used in electrification developments in this country also. It is contemplated for the conversion of the main line of the North Eastern Railway from York to Newcastle. On the Melbourne lines multiple unit passenger trains are employed throughout, and the existing rolling stock has been largely utilised. A maximum speed of 32 miles per hour is provided for. It is satisfactory to note that with one exception all the work has been carried out by British and Australian firms, apart from that executed by the railway department itself.

Trolley and Battery Combinations.

The development of many a good thing was held up by the war, and now there is a prospect of promising devices coming into their own. One of these is the combined railless trolley and battery vehicle designed by Mr. C. J. Spencer while he was general manager of Bradford Corporation Tramways. It took the form of a lorry for carrying tramway stores, and underwent its trials in May, 1916. An illustrated description appeared in our issue of June 6, 1916. The vehicle has been in service since the summer of that year, and has proved extremely useful. The chassis is that of a trackless trolley omnibus, and it is fitted with a trolley to take current from the tramway wires, while an Edison battery is carried which can run the vehicle for several miles where there are no overhead wires. There is an earthing device when the lorry is working on the tramway or trackless trolley routes, and it is during these times that the battery is charged. The Tramways Committee of Bradford now contemplate developing the idea for other purposes. The Ministry of Transport have shown that their eyes are wide open to all possibilities, and they have recently applied to the Bradford tramway department for figures of working expenses of the vehicle. These have been supplied by the present general manager, Mr. R. H. Wilkinson. The great convenience of a vehicle of the sort for various purposes is so obvious that it will not be surprising to see it adopted in many towns. If the same speed is desired when running on the low pressure current from the battery as when running on the higher pressure trolley wire current, some modification of the vehicle's electric equipment will, of course, be necessary.

Automobile Competition.

We notice from American contemporaries that Mr. W. Tuke Robson, formerly general manager and engineer of Southampton Corporation Tramways, took part in a discussion at the autumn meeting of the New York Electric Railway Association, which was held on December 10. Among the subjects dealt with at the meeting was what the Americans call auto-bus and auto-truck competition. The United States electric railway companies are suffering both as regards passenger traffic from motor omnibuses and as regards goods traffic from road motor wagons, known as auto-trucks. Various suggestions were made, as, for example, that owners of the motor vehicles should be subject to the same regulations as other common carriers. In regard to freight business in particular, the reader of one paper recommended on the part of the railway companies solicitation for business, prompt payment of claims, and the maintenance of schedules. Mr. Robson, in his remarks, explained to the gathering that

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British tramways have not engaged in the freight business, but that many of them work motor omnibuses as extensions, or for cross-town traffic, or for testing traffic on proposed tramway routes. He thought that there will be considerable development by tramway undertakings in Britain of the omnibus business, because of the present high cost of tramway construction. A comparison was also made by Mr. Robson of the way in which British tramways cater for short distance traffic with the way in which the short distance rider is discriminated against in America both as regards fares and scarcity of destination signs and directions as to places for boarding cars. In fact, Mr. Robson must have given his American colleagues in the business some useful information.

Locked Wheels on Curves.

Various lessons are to be learned from the report of the Ministry of Transport inquiry into the runaway car accident at Tynemouth. There is one point which should be emphasised, because many car drivers do not seem to realise it, though the fact is dinned into them, namely, that when a car is running by momentum and rounding a curve it is a most dangerous thing to apply the brakes to the extent of locking the wheels. If the wheels are locked, the car is pretty certain to overturn, while if the wheels are revolving the risk is much less. In the Tynemouth case the car got away downhill and was rounding the curve at considerable speed, but even so the inspecting officer thinks that if the wheels had not been locked the car would have negotiated the curve. In the cases of several accidents in the past it has been shown that locked wheels on a curve was the cause of the trouble. Perhaps the most convincing instance was an accident, if we remember rightly, on the South Metropolitan Tramways, where a car came to disaster when rounding a curve at a very slow speed. The speed, in fact, was so moderate that the accident seemed a mystery; but the inspecting officer found that the wheels were locked by the brakes, and he was quite satisfied that low though the speed was the fact that the wheels were locked was a sufficient explanation of the accident. It therefore behoves those who carry out the training of drivers to instil still more forcibly into their minds that one of the things they must never do, in the case of a runaway, is to enter a curve with the wheels locked. The efforts at braking should be modified as soon as the curve is reached. Then the car may come through all right, but if the wheels are locked it has a poor chance.

A New Sort of Competition.

Everybody in the business knows that the street railway companies of New York City, like those in many other American towns and like some tramway undertakings in this country, are in a wretched state financially. Unless they can get permission to make substantial increases in fares, it may be said that they are "beyond the help of man." The New York companies, too, just as do London municipal tramways, suffer from motor omnibus competition. But in the latter connection a feature seems to have arisen which even in America is perhaps unique, and which in this country would probably be impossible. A gentleman who has recently returned from a visit to New York informs us that the position is this. When the present Mayor of New York was a candidate for the office, he professed to be a friend of the street railway companies; and the latter, of course, hoped that if he became Mayor he would help them in any proper steps to improve their financial position. After he became Mayor, however, he developed tendencies which could only be considered prejudicial to the companies, and the allegation now is that he is encouraging an undertaking which runs motor omnibuses in competition with the street railways. Whether this is true or not the statement is at least freely made in New York. It is really remarkable that such a condition of affairs should be even a possibility, not to say a probability. Municipal matters in America are indeed a strange puzzle to people here, but yet the tendency to municipalise street railways in a number of American towns continues to grow.

BELGIAN RAILWAY ELECTRIFICATION.—Some time ago the Belgian Government decided to adopt electric traction for the State railways. The first line to be taken in hand will be that from Brussels to Antwerp, a distance of about 30 miles.

RAILWAY ELECTRIFICATION IN BUENOS AYRES.—It is reported that the Western Railway will electrify its lines from Buenos Ayres to Castelar, a distance of about 20 miles, at an approximate cost of £1,000,000. It is also stated that the directors of the Southern Railway will shortly announce their intention to electrify the line to La Plata.

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PASSENGERS "PROFITEERING."

SIR A STANLEY'S VIEW OF INADEQUATE FARES.

Presiding at a New Year concert given by employees of the Underground traffic group at the Central Hall, Westminster, on January 5, the Right Hon. Sir Albert Stanley, M.P., who was warmly received, said that as head of the combined undertakings he had taken the liberty of sending the following telegram to His Majesty the King—

> This reunion of employees of the Underground and allied companies now gathered at the Central Hall, Westminster, and representing 35,000 members of the staff, wish to tender to His Majesty the King an expression of their loyalty to the Throne, and to say that the spirit which inspired 16,000 members of the staff to bear arms in the late war still inspires them in the great work of reconstructing the transport facilities of the Empire's capital.

Later in the evening Sir Albert announced the receipt of the following reply—

> The King has received with much pleasure the loyal greetings from the members of the staff of the Underground and allied companies which you have addressed to his Majesty. The King gratefully recognises the splendid work of the men and women connected with these companies, both in the field and at home, during the great war. In thanking them for their message, the King appreciates the efforts of those who over and under ground endeavour to ensure to London and its suburbs a transport service worthy of the centre of a great Empire.

IMMENSE GROWTH OF LONDON'S PASSENGER TRANSPORT.

Continuing "The Chairman's Remarks," Sir ALBERT STANLEY said he would first say to his associates in the Underground and to those who had come in since he left about two and a half years ago to become President of the Board of Trade, that he was pleased to find himself back amongst them. During that period he had found very much to occupy his time, and he was not attempting to disparage political life when he said that he was glad to find himself back again with his old friends and associates, and that he would perhaps find a rather more placid atmosphere than he did during his political experiences. He was not sure, however, that it was going to be a more placid experience in the near future. On this, the first occasion he had had for three years of meeting his fellow-workers and the employees of this great enterprise, he desired to take the opportunity of saying how deeply he appreciated the splendid work they had done during his absence. This great enterprise was carried on during those years with great skill and gallant zeal in meeting and overcoming the difficulties that had been met with during the war, and he desired to express his thanks and heartfelt appreciation of the admirable manner in which an undertaking comprising some 35,000 employees had been carried on. He recalled his experiences with gatherings of this kind as they formerly existed. He thought that he used to refer to them as an assembly of his official family. Twelve years ago it was a very small family of about 4,000 employees, but it had grown until they now had an official family of 35,000. Those of them who had brought up a family had perhaps asked themselves year by year how they were going to find the money required. He thought that was also the sort of experience met with in business life. Twelve years ago they had a revenue of about £78,000 a month. They now had a gross revenue of at least one million pounds a month. Twelve years ago the weekly pay roll was about £6,000, and they used to think that a great sum. It was now £130,000 a week, and he could assure them it was sometimes not easy to find all that sum. Whereas a few years ago they were carrying from 300,000 to 400,000 passengers a day, they were now carrying four million passengers a day. Whereas 12 years ago their car mileage in transporting those 400,000 passengers was equivalent to three times round the world, to-day their trains, omnibuses, and tramways ran a daily mileage equivalent to 20 times round the earth.

EXPENDITURE EXCEEDS RECEIPTS.—HIGHER FARES.

They would realise that this was an immense business to carry on. To those who had been conducting this great enterprise these last three of four years very much credit was due, and he should not wish on an occasion of this kind to introduce a discordant note. But he must say that the undertaking to which they had the honour to belong had never had in its treasury more money than was necessary to carry on. He was sorry to have to say to those engaged in this undertaking that stupendous as was the traffic, it was an unfortunate fact that they had not enough money at the end of the week, or at the end of the month, to meet the expenses of carrying it on. He was sure that every man would do his best to see that the companies got a fare from every passenger carried. Some people might say "you had better get someone who can at least earn enough to pay something to the poor shareholders." He could promise such an aspirant that he would find himself surrounded by workers who were doing their best to make the undertaking a success. Speaking for himself, for his colleagues, and for all the staff, he could only say that they were doing their best to earn the profit which ought to be shown, and to provide an efficient service for the people of London. He did not think there was any great waste going on in the undertaking. He thought that the real trouble was not that there was profiteering in the organisation, but that profiteering was going on outside the organisation. If there was any profiteering at all it was among the passengers who rode in their vehicles. They were receiving service which was much greater than the fare they paid in exchange. He read in the newspapers the other day that a trade union official stated that fares were high enough, and if they were raised the public had the means of taking the companies to task. It was interesting to hear talk of that kind, but if those who rode on the omnibuses, cars, and tubes were not paying enough to enable the undertaking to be carried on, where were they to get the money from? Some people seemed to think that it was only necessary to put their hand in the air to find the means to carry on with. He had never found it so. (Laughter.) The only way he knew of getting money was by genuine hard work. He could not resist the opportunity of giving his fellow workers some of the information he possessed regarding the undertaking, as he was sure that they desired as much as he did that the undertaking should be made prosperous. He asked those who had knowledge of these enterprises to continue to show the same degree of loyalty and support which they had given in the past. He considered that it was right that everyone should have joy and happiness in their duties and work, and receive fair payment for the services they gave, and that in return they should treat their employers in an equally fair manner. (Applause.)

ELEVATION TO THE PEERAGE.—DIRECTORS' CONFIDENCE.

LORD GEORGE HAMILTON expressed the satisfaction experienced by the directors of the Underground group that in the spirit of patriotism which had always characterised Sir Albert Stanley he gave up his position in order to become President of the Board of Trade. So well did he discharge his work for the country that the King had conferred a peerage upon him. (Applause.) Referring to the position of the companies, his lordship said that the directors believed in the public's sense of justice and fair play. Although they might have trouble with the proposals as to increased fares, he contemplated the future with complacency so long as they had such a chairman as Sir Albert Stanley. He proposed a vote of thanks to Sir Albert for his services in the chair that evening.

The vote was accorded with musical honours.

In reply, Sir ALBERT STANLEY remarked that when he was in America he learnt to appreciate the qualities of a real English lord, but if someone had told him that he himself would one day be a member of the House of Lords he would have died of fright. (Laughter.) He could only say that if some men were born under a lucky star he must be one. From the bottom of his heart he thanked them for the assistance they had given to him, and he would do the best he could in helping to steer the ship back again into a state of prosperity. (Applause.)

An excellent programme of vocal and instrumental music was submitted under the direction of Mr. J. A. Meale, F.R.C.O. The principal vocalists were Messrs. F. Webster, J. Farrington, and C. E. Robison, and Miss F. Mellors. Mr. H. Gordon and G. Buck proved popular humorists. A choir composed of over 200 members of the staff acquitted themselves with great credit under the conductorship of Mr. A. E. Musgrove, and the same remark is applicable to the military band of over 50 members of the staff, directed by Mr. A. Goodfellow. At the organ was Mr. E. Stanley Roper, while Mrs. Rivers was the choir accompanist at the grand pianoforte. Mr. H. Townsend accompanied the vocalists. Mr. A. Wildman rendered a piccolo solo with band accompaniment, and a charming item was Mr. Meale's organ rendering of the overture to "William Tell." The gem of the evening was the descriptive scena "Victory and Thanksgiving" (Walter Partridge), rendered by the band, choir, organ and carillon, conducted by Mr. Meale.

Sir Albert Stanley was accompanied by Lady Stanley, Lord Geo. Hamilton (chairman of the Underground group), Lord Farrer (deputy chairman of the London Electric Railway), Lord Stuart of Wortley (deputy chairman of the City and South London Railway), and the following directors—Lord Knutsford, Mr. H. A. Vernet, Mr. J. Devonshire, Mr. F. C. Jenkins, Mr. G. Watson, Mr. E. R. Soames, and Sir A. Roger. Among the officers of the companies present were Messrs. H. E. Blain, E. Knapp, G. J. Shave, P. J. Thomas, A. R. Cooper, C. J. Spencer, A. R. Cooper, J. B. Lindsey, J. C. Mitchell, A. Rozier, J. Landsdowne, S. J. Webb, W. A. Agnew, and A. V. Mason.

THE BRITISH ELECTRICAL FEDERATION, LIMITED.—We are informed that the British Electrical Federation and most of its member companies have returned from the Manchester Hotel, Aldersgate Street, to Electrical Federation Offices, 88, Kingsway, W.C., over the Holborn station of the Piccadilly Railway. As the Government has retained part of the building, the engineering and stores departments of the Federation are for the present located in adjacent premises at 11-13, Southampton Row, while the Electrical and Industrial Investment Company and other finance companies are at 4, Broad Street Place, E.C.

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INCREASE IN FARES.

In the House of Commons, on December 8, Mr. Grattan Doyle asked the President of the Board of Trade if his attention had been called to the many complaints regarding the greatly increased fares charged on tramways under the management of public bodies, rivalling, if not exceeding, the charges on omnibuses owned by companies which were seeking to make a dividend; and whether, seeing that the object of Parliament in granting the London County Council and similar authorities a practical monopoly of the public thoroughfares was to serve the interests of the community rather than to earn a dividend, before granting additional powers to these bodies, he would make it a condition that the claims of the travelling public should have first consideration.

Sir Eric Geddes (Minister of Transport) replied—Certain tramway undertakings have been empowered to increase fares in accordance with the provision of the Statutory Undertakings (Temporary Increases of Charges) Act, 1918. Where the undertakers are a local authority, no modification may be authorised which will in any case increase the statutory maximum by more than 50 per cent., or by an amount which is more than sufficient to enable the undertaking to be carried on without loss. In view of the increases in wages and other expenses, increased charges are in some cases warranted, but the hon. member may rest assured that the claims of the travelling public are given full weight in connection with the consideration of all such applications.

Sheffield City Council on December 10 adopted the proposal of the Tramways and Motors Committee that the minimum fare should be raised to 1½d. In support of the recommendation, Sir William Clegg, chairman of the committee, said that not until he was absolutely driven by force of circumstances had he suggested to the Council the necessity for the increase in fares. He had been one of those who had always held the opinion that the trading undertakings of the Corporation should be self-supporting. The figures showed that at the end of June last there was a net balance on the first three months' working of the present financial year of £12,927. At the end of August this had been reduced to £11,839, and on September 29, the end of the half-year, the balance had been still further reduced to £4,723. For the period from March 26 to November 29 there was a deficit of £2,764, and from September 20 to November 29 there had been an average weekly loss of £1,233.

Dealing with the question of wages, Sir William said that during the four weeks ended November 23, 1918, the wages bill was £20,609. In the corresponding four weeks of this year the committee had to pay £35,000, an increase of £14,393. Since March, 1914, the cost per car-mile had gone up from 9½d. to 1s. 6½d.; electrical energy was now costing 1·033d. per unit, as compared with ·8d. in 1914. Tramway rails had risen from £9 10s. a ton to £24; petrol had increased from 1s. a gallon to 2s. 1½d.; armature coils were 100 per cent. up, and tramcar tires cost 103s., as compared with 24s.

However startling these figures, they were less remarkable than those with regard to the wages increase. In round figures the bill had increased between March, 1915, and the present time by nearly £230,000 per annum. The money to meet these expenses must come either from fares or rates. A reasonable and business-like method would be to obtain the income from the travelling public. Notwithstanding the increases, including the one now proposed, Sheffield would still have, with one exception, the cheapest riding in the country. Including previous increases and the present proposal, the total would amount only to 50 per cent., and he hoped, although no one could foresee the future, that this increase would be the last.

Underground Railway Fares.

London.—A Bill has been deposited at the Private Bill Office of the House of Commons for introduction in Parliament next session to increase the maximum tolls, rates, and charges on the London Electric, the Metropolitan District, the City and South London, and the Central London Railways. The preamble states that owing to the great increase of wages paid and the compulsorily restricted working hours, and the great increase in the cost of materials, repairs and maintenance generally, the authorised charges are insufficient. The Bill will empower the companies to fix a maximum rate not exceeding 4d. per mile for first-class and 2d. per mile for every other passenger. The companies are asking for power to charge two miles for any less distance and one mile for every fraction of a mile. The Bill proposes to annul the Cheap Trains Act, 1883, so far as it applies to these companies by doubling the maximum fare. The proposed maximum rates for small parcels will commence at 6d. for parcels under 7 lb., 1s. under 14 lb., 1s. 6d. for parcels not exceeding 28 lb., and 2s. for parcels not exceeding 56 lb. in weight.

The London United Tramways Company has deposited a Bill in Parliament applying for power to increase its fares. The preamble states that under the Statutory Undertakings (Temporary Increases of Charges) Act, 1918, the company was permitted to charge fares not exceeding 1d. per mile for ordinary passengers and ½d. per mile for passengers travelling in workmen's cars. These fares have now become unremunerative owing to the great increase in the cost of working, and the company therefore ask that powers be given to fix the maximum passenger fares at 2d. per mile instead of 1d. General power is also sought to lay down junction lines and to provide facilities for through running over other systems.

Bury Corporation General Purposes Committee are to consider proposals for the abolition of the 1d. stages on the Corporation Tramways.

Edinburgh Town Council, on December 3, agreed to the recommendation of the Tramways Committee that the minimum fare on the tramways be raised to 1½d.

Peterborough Electric Traction Company have given notice to the Town Council of their intention to apply to the Light Railway Commissioners for an Order authorising an increase of tramway fares from 1d. to 2d. per mile, or a portion of a mile.

Sheffield City Council having sanctioned an increase, single fares on all routes have been raised from 1½d. to 2d., except in the case of the Intake and Handsworth route, where the increase is from 2d. to 2½d., and the Petre Street route, which will be increased from 1d. to 1½d.

The Hull Corporation Tramways have been authorised, as from January 12, to fix all fares for any distance on each main route at 1½d. The fare on the Old Town route will be raised from ½d. to 1d. The estimated deficit for the year ending March 31 next was reported to the committee on December 18 as £11,892.

Manchester Tramways Committee evidently contemplate an increase in fares. Alderman J. Bowes, chairman of the committee, speaking at a meeting of the Council, said that there was no hope of a reduction in fares. They were spending nearly £500,000 a year in extra wages and war bonuses, and they did not want the tramways to come on the city rates.

Rowley Regis Council have asked the manager of the Birmingham and Midland Tramways Company to meet it in conference for the purposes of discussing fares, in regard to which there have been complaints. The recent increases are thought to bear heavily upon the passengers who travel short distances, and it is said that the fresh stages are very inconvenient.

Halifax Tramways are working at a loss. The borough treasurer Mr. G. H. Fry, reported at a recent meeting of the Council that for the eight months ended November 30 there was a net loss of £12,085. The income had exceeded the estimates, but owing to the increased wages and the high cost of material, the expenditure was much greater than had been anticipated. The new fares have yielded but little additional revenue, and power is being sought in the Corporation's new Bill to increase fares from 1d. to 2d. per mile.

Portsmouth Town Council, on December 9, adopted the recommendation of the Tramways Committee that 1d. sections of not less than a mile in distance be formed, that the existing sections and the charge for cheap tickets, school tickets, and workpeople's tickets be increased by 50 per cent., and that it be left to the chairman and vice-chairman to decide as to the date from which such increases shall take effect. The Mayor (Alderman Timpson), as chairman of the committee, said that Portsmouth was behind every other town in the United Kingdom in the raising of fares. They had done their best, but it was not possible to go on as a commercial concern without increasing the fares.

THE TRAMWAY INDUSTRIAL COUNCIL.

At a meeting in Leeds the following representatives of the district were appointed to the employers' section of the Yorkshire, Lancashire, and North Derbyshire area of the National Joint Industrial Council for the Tramway Industry.

The employees' representatives are—Messrs. A. A. Blackburn (Huddersfield), Albert Smith (Keighley), R. H. Wilkinson (Bradford), Balmforth (Doncaster), J. W. Hame (York), E. S. Rayner (Hull), with Messrs. H. L. White (Great Grimsby), E. A. Paris (Dewsbury), E. Nicoll (Barnsley), and W. McGibbon (Mexborough), Alderman H. Brown, Mr. A. R. Fearnley (Sheffield), J. B. Hamilton (Leeds), and H. England (Wakefield) are *ex-officio* members. Mr. R. R. Hubball (Leeds) was appointed secretary and treasurer, and it was recommended to the Joint Council that Alderman Brown be elected chairman of the Area Council.

Messrs. F. Thraves (Sheffield), H. Kershaw (Bradford), G. Cutsforth (Hull), G. W. Perkins (Leeds), G. Dodson (Halifax), W. Lofthouse (York), J. Birkhill (Wakefield), A. G. Long (Mexborough), T. Kerry (Lincoln), and T. Cobley (Sheffield), with Mr. H. Clay (Leeds) and Mr. M. Bradwell (Manchester) as members of the National Council. Mr. Thraves was appointed deputy-chairman, and Mr. Clay as joint secretary.

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FINANCIAL REPORTS AND MEETINGS.

BRAZILIAN TRACTION LIGHT AND POWER COMPANY.—A quarterly dividend of 1½ per cent. has been declared on the preference shares.

SOUTH SHIELDS CORPORATION TRAMWAYS for the year ended March 31 last show a net profit of £3,679, which the Tramways Committee propose should be transferred to the credit of the rates.

YORKSHIRE (WEST RIDING) TRAMWAYS COMPANY.—A final dividend has been paid of 3 per cent. (at the rate of 6 per cent. per annum) on the cumulative preference shares for the year ending December 31, 1919.

UNITED ELECTRIC TRAMWAYS OF MONTE VIDEO.—The directors have decided to postpone payment of interim dividend on the preference shares until the accounts for the past year have been received, and no interim dividend will be paid on the ordinary shares.

JOHN I. THORNYCROFT AND COMPANY, LIMITED.—The directors have recommended the payment of the following dividends for the year ended July 31, 1919: 3 per cent. on the preference shares, making 6 per cent. for the year, and 7½ per cent. on the ordinary shares, making 12½ per cent. for the year.

PROVINCIAL TRAMWAYS COMPANY.—The report for the year ended September 30 shows that the net revenue received from the local companies was £35,644. The directors recommend a dividend of 10d. per share on the ordinary shares and a bonus of 6d. per share, making with the interim dividend 10 per cent. for the year.

WOLVERHAMPTON CORPORATION OMNIBUSES.—The figures of the Wolverhampton Corporation omnibuses for the half year ended September 31, with those for the same period last year are :—Miles, 89,925 (60,551); passengers, 827,878 (566,539); receipts, £6,716 (£4,657); per car-mile 17·924d. (18·457d.). The Corporation propose to seek Parliamentary consent to enable them to start several new services.

THE AMERICAN CAR AND FOUNDRY COMPANY was registered at Somerset House on December 11 with a capital of £20,000 in £1 shares. The Company propose to deal in and act as agents for the purchase and sale of locomotives, carriages, wagons and rolling stock of all kinds for use on railways and tramways, or for road, field or other traffic. The registered offices of the company are at Georgian House, Bury Street, St. James', S.W.

HULL CORPORATION TRAMWAYS.—The Corporation tramways show a deficit for the half-year's working ended September last of £14,000. Hitherto the undertaking has contributed to the relief of the rates, but the greatly increased cost of wages and material has more than absorbed the surplus. Fares have recently been raised and the services rearranged with a view to increasing the revenue. Mr. E. S. Rayner, who has recently been appointed manager of the undertaking, has addressed a gathering of the employees, who promised their co-operation in an effort to put the undertaking on a sound basis.

AUCKLAND ELECTRIC TRAMWAYS COMPANY.—Mr. C. Sheriff Hilton, presiding at the annual meeting of the Auckland Electric Tramways Company, on December 8, said that the Corporation had exercised the option of purchasing and taking possession of the undertaking on June 1, and since that date the company had not been interested in the working of the undertaking. The whole of the purchase money was repayable in debentures of the Corporation. Mr. C. G. Tegetmeier was now on his way to Auckland to complete the arrangements in connection with the sale. The directors recommended a final dividend of 6d. per share, making 1s. per share for the year, carrying forward £9,776.

RANGOON ELECTRIC TRAMWAY AND SUPPLY COMPANY.—The directors have called an extraordinary meeting to pass a resolution that the control and central management of the company be transferred from the United Kingdom to Burmah, with the object of relieving the undertaking from liability to pay the home income tax in addition to the Indian income tax on the profits. It is estimated that the financial relief in the next financial year will amount to from £10,000 to £15,000. The meetings have been fixed for March 9 and 24. The passing of the resolution will involve the resignation of all the present directors, who are to be compensated for loss of office by double payment of £4,500 in addition to £2,000 to the managing director.

NATIONAL STEAM CAR COMPANY.—For the year ended October 31 there was a profit of £24,481 1s. 7d., after making provision for the maintenance of the omnibuses in operation, depreciation of plant, etc. A sum of £2,596 0s. 6d. is brought forward from the previous year, giving a total of £7,077 2s. 1d., out of which the directors recommend a dividend at the rate of 10 per cent. per annum less income tax. This will absorb £25,750, leaving a balance of £1,327 2s. 1d. to be carried forward. The directors report with regret that they have found it necessary to withdraw the omnibuses from the London streets in consequence of the unremunerative results which have developed during the past year. They are however, maintaining and extending the provincial services.

LEEDS CITY TRAMWAYS.—The report of Mr. J. B. Hamilton general manager of the Leeds City Tramways, for the year ended March 31, states that the receipts amounted to £723,033, an increase of £136,402. The working expenses, on the other hand, at £421,409, show an increase of £107,367, leaving a gross profit of £301,624, an increase of £29,036. The large increase in income is mainly due to the advances in fares. That the advances were absolutely necessary is shown by the greatly increased expenses. The earnings per car-mile were 18·954d., compared with 14·746d. in the preceding year. The working expenses were 11·047d. per car-mile. The passengers numbered 120,252,950, being a decrease of 4,266,169. A summary of the revenue account, with comparisons with previous years, is appended.

Year ended March 31.	1919.	1918.	1917.	1916.
INCOME—	£	£	£	£
Traffic revenue	712,522	577,168	507,755	467,197
Advertising	2,721	2,941	2,943	2,620
Mineral haulage	3,010	1,794	1,397	634
Rents	4,626	4,728	3,711	5,054
Sale of lost property	154	—	—	—
Total revenue	723,033	586,631	515806	475,505
EXPENDITURE—				
Traffic	209,014	158,282	130,245	114,724
General	51,986	43,942	40,141	41,190
Repairs and maintenance	113,131	73,606	55,084	42,786
Power expenses	45,521	38,212	35,415	32,015
Parcels traffic	1,727	—	—	—
Working expenses	421,409	314,042	260,885	236,227
Gross profit	301,624	272,588	254,920	239,278
Bank interest	2,832	3,309	2,379	4,413
Dividends on investments	17,873	12,989	7,377	5,867
	322,329	288,888	264,676	249,558
Interest on property	3,953	3,953	3,943	3,218
Interest on capital	55 749	53,743	49,777	49,444
Income-tax	35,844	23,257	17,847	15,349
Rent of lines	2,800	2,964	3,018	3,071
War allowances	10,479	12,053	12,890	13,272
Balance	213,504	193,187	177,201	165,204
BALANCE APPROPRIATED AS FOLLOWS—				
Redemption Fund	68,828	66,881	64,205	72,489
Cost of Acts	445	445	445	703
Renewals	54,231	61,764	30,000	3,146
Contribution to capital outlay	—	2,742	2,373	—
Third Party risk reserve	—	—	747	2,044
Reserve Fund	—	3,352		15,000
Net surplus to relief of rates	90,000	58,000	79,431	71,822

HUDDERSFIELD CORPORATION TRAMWAYS show a better result for the year ended March 31 last than for the preceding year, the gross profit being £2,973 more. The contribution to the rates was reduced to £6,750, and the carry forward was increased by £300. Traffic receipts per car-mile have increased to 19·25 per cent., but owing to increased costs of wages and materials the ratio of expenses has increased to 71·42 per cent. A summarised comparison of the accounts for the past your years is appended :—

	1919.	1918.	1917.	1916.
INCOME—	£	£	£	£
Traffic revenue	196,747	171,197	149,499	139,980
Sundry receipts	2,664	3,194	3,037	3,230
Total Income	199,411	174,391	152,536	143,210
EXPENDITURE—				
Traffic expenses	58,116	48,939	38,947	35,495
General expenses	9,077	8,522	7,965	8,196
Repairs and maintenance	50,977	41,940	29,220	23,913
Power expenses	22,344	18,189	14,717	12,377
	140,514	117,590	90,849	79,981
War allowances	3,060	3,937	4,957	4,451
	143,574	121,527	95,806	84,432
Balance to net revenue	55,837	52,864	56,730	58 778
Bank Interest	1,056	1,061	964	139
	56,893	53,925	57,694	58,917
Interest	11,171	11,386	13,064	13,764
Income tax on profits	11,674	8,613	7,332	3,789
Sinking fund	11,818	11,733	12,724	12,606
Renewals fund	15,180	15,037	15,368	19,752
Contribution to rates	6,750	8,800	8,600	8,400
Parliamentary expenses	—	406	406	406
Added to carry forward	300	*2,050	200	200
Mileage of track	56	56	56	56
Passengers carried	30,946,790	32,389,732	29,069,129	26,941,412
Fare per passenger	1·52d.	1·27d.	1·23d.	1·24d.
Mileage	2,496,051	2,822,606	2,868,172	2,841,442
Units per car-mile	1·94	2·00	2·02	1·96
Power cost per car-mile	2·18d.	1·57d.	1·25d.	1·06d.
Traffic receipts per car-mi'e	19·25d.	14·75d.	12·68d.	12·02d.
Expenses per car-mile	13·69d.	10·14d.	7·71d.	6·84d.
Traffic rev. per mile of single track	£3,510	£3,057	£2,670	£2,500
Ratio of expenses	71·42%	67·41%	60·77%	57·13%
Number of cars in stock	106	106	106	106

* From last year.

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SIR ALBERT STANLEY A PEER.

The Right Hon. Sir Albert Stanley, M.P., on whom a peerage has been conferred, was born at Derby in 1875, but early in life he went to the United States. There he was educated in Technical Schools, and subsequently took up railway work, entering the service of the Detroit United Railways. He received rapid promotion, and became general manager of the Public Services Corporation of New Jersey. In 1907 he returned to England as general manager of the Metropolitan District Railway and of the associated tube railways, and was later appointed managing director of the Underground Electric Railway Company of London and the associated undertakings. His work in the development of travelling facilities in and beyond the metropolitan area was recognised by the bestowal of the honour of knighthood in June, 1914. After the outbreak of war he assisted the Ministry of Munitions as Director of Munitions Transport, and when Mr. Lloyd George became Prime Minister in December, 1916, Sir Albert was appointed President of the Board of Trade. Owing to ill-health he resigned this position, and after a visit to America he was re-elected a director of the Underground Railways Company, and when Lord Claud Hamilton resigned the chair, Sir Albert Stanley succeeded him.

Sir Albert has assumed the title of Baron Ashfield of Southwell, in the County of Nottingham.

PERSONAL.

Mr. Henry Mozley, general manager of Burnley Corporation Tramways, has been granted an increase of £100 in salary, to £675 per annum.

Mr. Charles F. Ellwood, assistant traffic superintendent of Salford tramways, has been appointed traffic superintendent of the Hull Corporation Tramways.

Mr. J. Brierley has been appointed traffic manager of Southampton Corporation Tramways. He was formerly traffic superintendent of the Rhondda Tramways Company.

Councillor E. Turner has been appointed chairman of the Middlesbrough Corporation Tramways Committee, in succession to Alderman Joseph Calvert (the deputy mayor).

Mr. G. C. Milnes, manager of the Lancaster Corporation electricity undertaking, has been granted an increase in salary to £500. After February he will not devote any time to the tramways.

Mr. James Wild, manager of Ramsbottom Council Tramways for the past six years, has been appointed manager of Todmorden Corporation omnibus system, at a commencing salary of £300 per annum.

Mr. G. F. Moller, general manager of Lanarkshire Tramways Company, and his wife have been presented by the employees with a silver tea and coffee service and vases on the occasion of their silver wedding.

Mr. Edwin Jacob, who has resigned the position of managing director of the Tudor Accumulator Company, Limited, retains the business of the Rail Welding Company which he acquired from the Tudor Accumulator Company some time ago. His address is 119, Victoria Street, S.W.1.

Alderman E. Russell Taylor, owing to other business demands on his time, submitted his resignation as chairman and member of the Liverpool Tramways Electric Light and Power Committee at a meeting on December 5. On the motion of Councillor J. H. Naylor, it was agreed that a letter should be sent to Alderman Russell Taylor thanking him for his services to the committee.

Mr. Arthur Ellis, general manager and engineer of the Cardiff Corporation Tramways, who has retired from that position, in order to take private practice, has been presented with a silver inkstand and tray by the administrative staff of the Traffic Department. Mr. Ellis, in acknowledging the gift, said that although he was leaving the service of the Corporation he would remain in Cardiff.

Mr. Benjamin Hall has been appointed general manager of the Wigan Corporation Tramways at a salary of £450 a year, rising by annual increments of £25 to £600. Mr. Hall had held the position provisionally, and Councillor Guest, in recommending his appointment at the Town Council meeting, said that he had met all the difficulties as they had arisen with knowledge, ability, and assurance.

At a meeting of the Leeds City Council on January 7, there was some discussion on the recommendation of the Tramways Committee to appoint **Mr. J. S. Hamilton, D.S.O.,** chief assistant engineer at a salary of £500 per annum, **Mr. J. Burbridge,** second assistant engineer at a salary of £350 per annum, and **Mr. A. N. Daggett** as repair assistant in the car works at a salary of £250 per annum. In reply to a question by Alderman J. R. Ford whether the positions had been advertised, the chairman, Alderman R. A. Smithson, said it was the custom to advertise vacancies, but it was also the custom where suitable men were available to promote them to the vacancies without advertising. The sub-committee which went into these appointments was representative of all parties in the Council, and were unanimous in making the recommendation.

Mr. Joseph Wilkinson, who has retired from the position of electrical engineer of Hull tramways after nearly twenty years' service, has been presented by the employees with a typewriter and an umbrella. Mr. J. W. A. Renton, supervising engineer at the Liverpool Street tramway station, in making the presentation, described it as a spontaneous offering showing the esteem and respect in which Mr. Wilkinson was held. Mr. E. S. Rayner, the tramways manager, said he had known Mr. Wilkinson for many years, and had always found him genial and helpful. The spirit displayed by the men showed that when they had a good chief he could expect loyalty. Mr. Hyman, of the officials' and clerks' branch of the Municipal Employees' Association, said that he brought the best wishes to Mr. Wilkinson from 300 members, and expressed his feeling of gratitude to Mr. Wilkinson for many services. Mr. Wilkinson, who has had a long electrical experience, is now introducing battery vehicles into Hull, and his address is 4, Morpeth Street, Hull.

We regret to record the death, which took place in December of **Mr. W. G. Conner,** the son of Mr. J. Conner, O.B.E., manager of the English Electric Company's works at Preston. Mr. Conner was 33 years of age. In 1914 he was in Spain on work connected with Spanish ore, but on the outbreak of war he was sent to America to obtain tools and machines for the manufacture of ammunition. After the armistice he made a tour through America and Japan.

TRAMWAY AND LIGHT RAILWAY NOTES.

BURNLEY.

CARS BLOCKED BY TRACTION ENGINE.

The tramway service was obstructed by a traction engine on November 27 while it was drawing water from a pond. When the driver was summoned on December 22 it was stated that when he stopped the engine to take water from the pond he blocked the tramway lines so that no car could pass. He was asked to draw his engine to the kerb, a distance of six inches, which would allow the cars to pass, but he refused to do this for a period of ten minutes, and during this time six cars full of workpeople were held up. The magistrate imposed a fine of 10s., or six days' imprisonment.

BARROW.

NO FREE PASSES.

Barrow Town Council, which has purchased the local tramways from the British Electric Traction Company, and took over the management on January 1, has decided that no free passes shall be granted. Even the Corporation officials are included in the embargo.

BELFAST.

INSUFFICIENT POWER.

Recently there have been some stoppages of the Belfast tramway service, lasting in one case about 15 minutes, owing to deficiency of electric power, which is supplied from the Corporation lighting station. It was officially explained that the electricity station is at present producing the maximum output, and between the hours of 4.30 and 6 p.m., when the shipyards, other manufactories and business premises consume extra current for lighting purposes, the power available for tramways has not been sufficient.

BEXLEY.

EX-SERVICE EMPLOYEES.

On December 24 the last three women conductors of the Bexley Council Tramways ceased work and only men are now employed. Eighty per cent. of the employees of the Bexley Tramways are ex-service men, many of whom gained decorations.

BOLTON.

DAMAGES FOR MAN INJURED WHEN WALKING ON THE TRAMWAY TRACK.

In an action against the Bolton Corporation Tramways for personal injuries caused by the alleged negligence of their servants, W. J. Ashworth was awarded £300. One night in March last there had been a fall of snow and the footpaths were covered with snow and ice. The plaintiff, who was 62 years of age, considered the footpath dangerous and walked along the tramway track which had been cleared of the snow. He was knocked down by a car and received injuries which necessitated his absence from business. The driver of the car said that he was driving at the rate of eight miles an hour and did not see the plaintiff until he was about four yards from him. He slowed down and put on the brakes, but it was too late.

BRIGHTON.

RECORD TRAFFIC.

Brighton Corporation Tramways are expected again to contribute £7,000 to the relief of rates. The traffic returns for the current year show a further increase and it is expected that with average weather the remaining three months of the financial year will bring the increase to £25,000, which would form another record in the history of the undertaking.

BURY.

FREE TRAVELLING FOR THE BLIND.

The Tramways Committee have granted a request of the local branch of the National League of the Blind to allow blind persons to travel to workshops at Bolton on the cars free, on the understanding that the committee accept no responsibility for injury to such persons when travelling on the cars.

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COLCHESTER.

WOMEN CONDUCTORS WITHDRAWN.

Colchester Town Council have decided to replace their women conductors with men, preference being given to married ex-service men.

DERBY.

PARCEL SERVICE.

A scheme for a tramways parcel service, including collection and delivery, has been adopted by the Town Council, and the Tramways Committee are to consider the necessary details.

DUNDEE.

NO FARE REDUCTION.

A proposal to appoint a committee to consider the management of the Dundee tramways was defeated at a meeting of the Dundee Town Council by 28 votes to 3. The supporters of the motion alleged that a great mistake had been made in increasing the fares and urged that a reversion should be made to the system of halfpenny fares. Mr. G. A. Johnston, a member of the Tramways Committee, retorted that in view of the greatly increased expenditure, it was hopeless to expect that fares could be reduced.

EAST HAM.

NEW CARS.—TRAMWAY LEASE.

East Ham Borough Council have ordered four double deck cars at a cost including equipment of about £2,100 each.—The Tramways Committee have recommended the acceptance of Ilford Urban Council's offer to give a lease of Ilford Hill track, viz. :—The lease to run for a definite period of three years from July 1, 1919, at the following rates, viz. :—First year, 6½d. per car-mile ; second year, 6¾d. per car-mile ; third year, 6¾d. per car-mile.

EDINBURGH.

INCREASED SPEED.

The Tramways Committee have decided to accelerate the service on the Murrayfield, Grange, and Craiglockhart routes by about one mile per hour. The present speed is 9·3 miles per hour and the new rate will be 10·6 miles.

GLASGOW.

TRAFFIC REGULATION.—PROPOSED EXTENSION.—INDUSTRIAL COUNCIL.—TRACK RENEWAL.

Article 10 of the by-laws of Glasgow Corporation regulating the traffic in the streets requires that when a tramway car is standing at a tramway stopping place, every driver of a vehicle who intends to pass on the left or near side of the car shall draw up immediately before reaching the stopping place until the roadway is clear of passengers entering or leaving the car. At a meeting of the Council in December the senior magistrate was asked if he was aware that the by-law was not being enforced in the city, and that there was danger to the lives of passengers. The magistrate replied that there had been seven convictions in the last three months for violation of the by-law, and that further steps would be taken to protect the public.—Important extensions of Glasgow tramways both within and beyond the boundary of the city are indicated in a report recently submitted by the general manager, Mr. James Dalrymple, to the Finance Sub-committee of the Tramways Committee. The total mileage of the extensions would be about 11½ miles, and the cost about £460,000. Various other extensions to outlying points that have been suggested from time to time would aggregate an additional length of 13½ miles of track at a cost of £540,000. These estimates include no allowance for the erection of bridges over the Clyde at certain points.—Glasgow Corporation has refused to be represented on the National Industrial Council for the tramway industry. As a consequence, a circular has been forwarded by Mr. A. G. Gee, secretary of the district committee of the United Vehicle Workers (Glasgow branches) to Glasgow members of Parliament and to the members of the Town Council, stating that under no consideration are the Corporation tramway workers going to make a local settlement on wages, hours, and general conditions of labour which is not in conformity with national settlements.—Glasgow Tramways Department hope to be able to renew the rails on at least ten miles of double track before the end of the financial year in May next.

HUDDERSFIELD.

DEVELOPMENT SCHEME.—WOMEN CONDUCTORS.

Huddersfield Town Council have unanimously approved the promotion of a Parliamentary Bill to empower the Corporation to construct tramways in the district of Fixby and the borough of Brighouse ; to confirm an agreement with the Brighouse Corporation ; to increase fares and to authorise the running of omnibuses without the boundary of the borough ; and to construct railway sidings in connection with the Corporation's gas and electricity undertakings.—Huddersfield Corporation dispensed with the last of its women conductors on December 9. Each women employee who has been in the continuous service of the tramways department for a period of over two years is to be presented with a silver and enamel brooch bearing the arms of the borough, over which is the inscription, "The Great World War, H.C.T., 1914-1919." The general manager Mr. A. A. Blackburn stated that during the war the department had employed 211 women conductors and 45 car cleaners, of which 132 had been employed for a period of one year and 60 for more than two years.

LEEDS.

LOSS ON WORKMEN'S FARES.

At a meeting of Leeds City Council on January 7, it was reported that the workmen's fares on the tramways entail an annual loss of £44,565. A motion to extend the morning period for the use of such tickets was defeated, and Ald. Smithson, chairman of the Tramways Committee, mentioned that a sub-committee were now considering the question of raising all fares.

LINCOLN.

OVERHEAD TROLLEY SYSTEM.

The erection of the overhead wire system which is to supersede the surface contact system at Lincoln is practically completed. Three new cars have been delivered and the eight at present in use are being adapted to the overhead system.

LINCOLNSHIRE

NEW LIGHT RAILWAY.

The proposed light railway scheme that will open up the extensive agricultural district of Crowland, South Lincolnshire, is expected to be taken in hand shortly, as the Board of Agriculture appear now to be more favourable to the scheme. The line will be about five miles in length and will join the Midland and Great Northern Joint Railway at Eye Green on the Peterborough and Wisbech line.

LONDON.

TRAFFIC EXPERIMENTS.—STEPNEY APPROVES TROLLEY.

Modifications in the stopping places of motor omnibuses and tramway cars in London, recently fixed by the Advisory Committee on London Traffic, have been made. All the arrangements are experimental and the effects are being carefully watched. It has been recommended that notices worded as follows : "London Traffic Committee—Slow moving traffic keep near the kerb," should be displayed experimentally on certain routes. On two roads where fixed stopping places for omnibuses have been arranged, there are about six stopping places per mile, four of which are compulsory and two optional. The police, tramway authorities, and omnibus companies will be asked to submit early reports on the results of the new regulations.—Stepney Borough Council has given permission to the London County Council for the adoption of the overhead trolley system in Burdett Road and Grove Road. Alderman J. Provost, who moved the resolution, said that he proposed a similar resolution ten years ago, which was then defeated.

NEWCASTLE-ON-TYNE.

PROPOSED EXTENSIONS.

In the Bill of the Newcastle Corporation to be submitted in the next session of Parliament provision is made for linking up the Newcastle and Gateshead tramways. A double line is to be constructed across the high level bridge, which at present carries the North Eastern railway but no tramway.

NOTTINGHAM.

PROPOSED EXTENSIONS.

The Bill deposited by the Nottingham Corporation providing for the extension of tramway includes, among other items, powers to construct lines to Hucknall, Beeston, and Chilwell, to make certain street widenings in those parishes, and to run motor omnibuses.

PLYMOUTH.

APPRENTICESHIP SYSTEM.—POINT CONTROLLERS.

The scheme of apprenticeship suggested by the manager and engineer of the Plymouth Corporation Tramways (Mr. H. P. Stokes) has been adopted by the Council. Under this scheme the boys now engaged as conductors on the cars will be taken into the workshops, and arrangements made to apprentice them to particular trades in accordance with their personal inclination and ability.—Plymouth Tramways Committee have approved the purchase of automatic point controllers for nine places on the tramway system so as to obviate the further employment of boys.

ST. HELENS.

CAR WITHOUT LIGHTS.

A case of a very unusual kind came before the Wigan County Bench on December 19, when the motorman of a St. Helens tramcar was summoned for driving without lights. It was stated that the trolley of the car came off, and instead of applying the brakes the driver allowed it to run down an incline to the terminus without any lights. The defendant, who said he was not aware that the trolley was off, was ordered to pay the costs.

SOUTH SHIELDS.

EXTENSION AUTHORISED.

The Light Railway Commissioners, as the result of their inquiry, have granted the application for extension of the South Shields Corporation Tramways as far as it relates to the construction of one mile four furlongs and seven chains of light railway from the tramway in the borough to the southernmost corner of the Corporation's Cleadon Park estate. The cost of the scheme will thus be reduced by £30,000.

SWANSEA.

FUNERALS ON TRAMWAY TRACKS.

Swansea Corporation Tramways Committee have asked the chief constable to ensure that funerals are diverted from tramway tracks.

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CONTRACTS AND ORDERS.

Walter Scott and Company's tender for tramway rails has been accepted by Manchester Corporation.

Macintosh Cable Company have an order from Heywood Council for the supply of E.H.T. and L.T. cables.

Edgar Allen and Company, Limited, are to supply tramway points, crossings, and accessories to Leyton Council.

Cardiff Tramways Committee propose to invite tenders for fifteen complete tramway cars and fifteen chassis.

Southend Town Council has accepted a tender for the supply of tramway points and crossings from Edgar Allen and Company, Limited, at £540.

The British Hele-Shaw Patent Clutch Company have received an order from Salford Corporation for British steel pinion wheels and gear wheels at £594 12s.

Liverpool Council has accepted tenders for special steel work for tramway loops and cross-overs from Edgar Allen and Company, Limited, and Hadfields, Limited.

Ipswich Corporation have accepted the tender of the Brush Electrical Engineering Company, Limited, amounting to £24,675, for a 3,000 KW. Ljungstrom type steam turbo-generator.

Manchester Corporation has accepted tenders from the English Electric Company, Limited, for tramcar motors, and from Edgar Allen and Company, Limited, Hadfields, Limited, and the Titan Trackwork Company, Limited, for special track work.

Bolton Electricity Committee are obtaining a 12,000-KW. 3,000 revolutions per minute turbo-generator from Escher, Wyss and Company, of Zurich, Switzerland, with a 12,000-KW. alternator from the Metropolitan-Vickers Electrical Company, Limited.

Clough, Smith and Company, Limited, of 26, Victoria Street, London, S.W., have been awarded the contract for the supply and erection of the overhead electrical equipment for the Lee Green to Eltham extension of the London County Council tramways.

Liverpool Tramways Committee have recommended that the tender of the Metropolitan-Vickers Electric Company, Limited, Trafford Park, Manchester, for the supply and erection at the Lister Drive electric power station of a 12,500-KW. turbo-alternator be accepted.

Bournemouth Permanent Way Contracts.—In regard to the reconstruction of the permanent way of Bournemouth tramways, the general manager has reported to the Council that tenders would be in by January 20, and the tramways Committee was authorised to accept the lowest satisfactory tender received.

Preston Town Council are purchasing six single deck tramcars from Sheffield Corporation for £350 each. The cars will be repaired, painted, etc., at an estimated cost of £100 each. The tender of Messrs. John Cartmell and Sons, Limited, for the supply and fixing of wooden doors to the tramway car shed for £83 has been accepted.

Dundee Corporation have accepted the following tenders for 19½ miles of cables for the electricity works: British Insulated and Helsby Cables, Limited, £13,310; Callenders' Cable and Construction Company, Limited, £3,842; Enfield Electric Cable Company, £7,389; and W. T. Henley's Telegraph Works Company, Limited, £1,900.

East Ham Tramways have ordered four additional double deck cars (similar to those now on order) from the Brush Electrical Engineering Company. The cars will have Brush car bodies, costing £1,320 each, with the British Thomson-Houston Company's equipment at £701 each, plus 5 per cent. The Brush Electrical Engineering Company have promised delivery of the six cars by March next, the four additional cars to be delivered as early as possible afterwards.

Bradford Tramways Committee have accepted tenders for the supply of materials for track reconstruction as follows:—Walter Scott, Limited, 400 tons high silicon steel rails, £8,400 (subject to satisfactory arrangements as to time of delivery); Hadfields, Limited, 6 tons steel tie bars, £228; Britannia Lamp and Accessories Company Limited, 3,500 copper rail bonds, £659; Bayliss, Jones and Bayliss, Limited, 18 tons wrought-iron welded rings, £706 10s.; W. H. McKenzie, 1 ton clips, £35 5s.; Cordingley, Armstrong and Company, 2 tons bolts and nuts, £96; and 70 tons round mild steel rods, £1,627 10s.

New Rolling Stock for Bournemouth.—A report from the Tramways Committee was received by the Bournemouth Town Council on January 5 in regard to the purchase of new cars, of which 20 are required. Tenders had been received from the British Thomson-Houston Company, Limited, the J. G. Brill Company, the Brush Electrical Engineering Company, Limited, Hurst, Nelson and Company, Limited, the Metropolitan-Vickers Electrical Company, Limited, and the English Electric Company, Limited. The J. G. Brill Company later withdrew their tender. The following were accepted—(1) Brush Electrical Engineering Company, Limited, for car bodies, trucks and spares, £39,378; (2) British Thomson-Houston Company, Limited, for motors and electrical equipment and spares, £17,316 3s. 6d.; (3) Metropolitan-Vickers Electrical Company, Limited, for track and electric brake equipment and spares, £9,240; total, £65,934 3s. 6d.

PATENT LIST.

Abstracted for "The Tramway and Railway World" from the Official Journal of Patents.

***** If the inventions have been communicated the names of the communicators are given in italics.**

APPLICATIONS FOR LETTERS PATENT.

The number of the patent is given in brackets.

Lifting jacks (29,103)—W. B. Templeton.
Change-speed gear for automobiles (29,092)—G. M. Tyler.
Transmission gear for motor vehicles (28,979)—R. T. Zeale.
Driving gear for motor vehicles (29,700)—W. Barr.
Variable speed gears for motor vehicles (29,566)—T. Barton.
Mechanical ignition device for petrol, etc., engines (29,483)—M. Ling-Bevington.
Lifting jacks (29,236)—H. P. L. Biggs.
Driving gear for motor vehicles (29,520)—R. Blakoe.
Indicator for indicating direction of travel of road vehicles (29,558)—T. Crow and D. W. Scott.
Electrically driven motor vehicles (29,538)—A. Décorat.
Fluid pressure brakes (29,811)—I. O. G. Drolshammer.
Electric tramway cars (29,836)—D. R. Drummond.
Motor vehicle tires (29,335)—W. Geach.
Tires for motor vehicles (29,677)—G. Goody.
Shock absorbing device for road vehicles (29,388)—J. H. Jepson.
Splash-guard for motor vehicle wheels (29,543)—E. S. Johnson.
Self-propelled vehicles (29,818)—J. Landon, Landon and Martyn, and F. W. Martyn.
Road vehicles, wagons, motor trailers, etc. (29,241)—H. P. Martin.
Lifting jacks (29,470)—W. Matthewman.
Conductor rails for electric railways, etc. (29,280)—Merz and McLellan and S. G. Redman.
Variable speed gear (29,545)—J. Nelson.
Spraying apparatus for automobiles for laying dust raised on roads (29,238)—A. A. Pitt, J. Thomas, and J. A. Vanrossum.
Signalling apparatus for motor vehicles (29,713)—W. M. Rolph.
Variable friction gear (29,311)—A. E. Salway and C. Salway.
Non-skidding device for motor vehicles (29,546)—E. Searle.
Compensating driving mechanism for self-propelled vehicles (29,506)—W. G. Southwood.
Car lock for steering column of motor cars (29,204)—G. F. Stagg.
Vehicles with tipping bodies (29,479)—A. J. Thomas.
Automatic variable speed gear for automobiles acting as automatic clutch and differential gear (29,829)—R. Toudeur.
Motor vehicles (29,202)—J. Weller.
Fluid pressure braking apparatus (29,226)—H. H. Westinghouse.
Traffic indicators for motor vehicles (29,376)—S. H. Keen.
Supporting engines of motor vehicles upon frames thereof (29,578)—A. Ryner.
Shock absorbers for vehicles (30,077)—C. Agnelli.
Disc road wheel for motor vehicles (29,849)—A. E. Alway and T. N. F. Alway.
Omnibus covers (30,327)—J. H. Baker, J. Smith, and T. B. Smith.
Side screens for omnibuses (30,328)—J. H. Baker, J. Smith, and T. B. Smith.
Bases for trolley poles (30,009)—J. P. Barker.
Non-skid devices for motor vehicles (29,967)—E. H. Bramall and A. C. Norman.
Locking devices for motor vehicles (30,050)—T. Brindley.
Signalling systems (29,936)—British Thomson-Houston Company (*General Electric Company*).
Springing devices for motor vehicles (29,895)—A. Cairns and T. W. Cairns.
Differential gear for road vehicles (30,560)—A. Cairns and W. Cairns.
Devices for measuring electric cables (30,176)—Callender's Cable and Construction Company and W. E. Benson.
Control mechanism for change-speed gears (30,190)—H. V. Collins.
Variable speed gear (30,245)—H. J. Crampton.
Starting and speed regulating apparatus for electric motors of electric vehicles (30,254)—A Décorat and E. Testavin.
Steering wheels for road vehicles (30,083)—M. Devlin.
Non-skid device for motor vehicle tires (29,983)—J. J. R. Dunkley.
Demountable wheels for motor vehicles (29,959)—G. W. Farrell and E. Newkirk.
Tramway car seats (30,416)—T. K. Fulton.
Temporary conversion of gauge of rail, etc., vehicle (29,932)—H. E. Girdlestone and C. B. Matthews.
Device for informing drivers of vehicles of persons boarding or alighting from their vehicles (30,432)—P. Gully.
Self-propelled vehicle wheel tires (30,164)—E. A. Holland and A. Payne.
Lifting jacks (29,873)—A. E. Lake.
Motor vehicles (30,597)—J. O. Nichol.
Lifting jacks (29,981)—F. L. Rapson.
Resilient tires for wheels of motor vehicles (30,084)—F L. Rapson.
Steering gear for motor cars (30,446)—C. M. Shaw.
Motor vehicle (30,040)—J. W. Smale.
Tramway lines (30,195)—C. E. Thomas.
Process of treating rails (31,032)—H. Adshead and W. N. Ross.
Locking mechanism for steering gear of motor vehicles (31,006)—F. Andresen.
Apparatus for electrically controlling railway trains, etc., through the track (31,199 and 31,200)—A. R. Angus.
Transmission gear for motor vehicles (30,968)—T. Antoine.
Steering trailer vehicles (30,840)—A. Arato.

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Drivers' seats for motor vehicles (30,934)—W. I. Atkins.
Means for automatically signalling when vehicle passes over predetermined point in a road (30,801)—E. Badger.
Non-skid attachments for wheels of motor vehicles (31,235)—M. Barr.
Control or resistance apparatus for suspension arrangements and shock absorbers of vehicles (30,992)—C. L. Beck, A. Gehenniaux and A. Lanser.

SPECIFICATIONS PUBLISHED.

1916.
Change speed gearing for automobiles, etc. (14,337—*101,872*)—L. A. Peterson.
1917.
Automatic train stops (18,103—*134,235*)—M. B. Bulla.
1918.
Brakes and brake mechanism of power propelled vehicles (16,082—*133,156*)—F. W. Lanchester.
Speed indicators (16,824—*133,182*)—L. E. Cowey.
Rail ties (16,851—*133,184*)—J. Zaliewski.
Transmission mechanism for motor road vehicles (17,116—*133,191*)—F. G. Woollard and Wrigley and Company.
Gear boxes of self-propelled vehicles (13,140—*133,386*)—Caterpillar Tractors Limited (*Holt Manufacturing Company*).
Oiling systems for change-speed gear boxes (13,141—*133,397*)—Caterpillar Tractors Limited (*Holt Manufacturing Company*).
Differential or balanced gearing (14,534—*133,397*)—F. Von Elbertz.
Liquid fuel for internal combustion engines and process for preparing same (16,398—*133,434*)—A. de F. Lopez.
Trolley shoes or collectors for electricity (16,593—*133,453*)—L. H. Shipman.
Change-speed gears (21,513—*133,544*)—G. E. Stanley.
Axle-box guards (8,817—*133,723*)—G. H. Sheffield and F. R. Rand and Company.
Oiling and cleaning devices for points and switches (16,592—*133,741*)—C. E. Gray.
Fluid-pressure braking apparatus (18,244—*125,357*)—W. V. Turner.
Lifting jacks (18,704—*133,818*)—F. L. Rapson.
Mechanism for transmitting motion and varying speed in motor-driven vehicles (17,704—*134,048*)—P. Ingham.
Suspension and adjustments of brakes for motor vehicles (19,450—*134,085*)—G. W. A. Brown, E. G. Grinham, and Arrol-Johnston Limited.
Six-wheeled motor vehicles (17,265—*134,273*)—C. F. Gros.
Life guard for omnibus and like vehicles (17,487—*134,282*)—S. D. Le Pipre.
Fluid pressure braking apparatus (17,598—*134,294*)—J. W. Cross.
Springing of motor road vehicles (17,712—*134,312*)—A. W. Smyth.
Shock absorbing mechanism for use in the suspension of vehicles (17,969—*134,603*)—G. E. Stanley.
Suspension devices for automobile vehicles (19,072—*120,922*)—M. A. Delque and C. M. Motte.
Chassis for motor vehicles (19,870—*134,660*)—J. Budge.
Joints for tramway and railway rails (13,320—*134,866*)—W. H. Meek and A. E. Sealy.
Emergency Axles for self-propelled vehicles (19,002—*134,955*)—E. C. Wiggins.
Electrical contact makers for use with the steering wheels of motor vehicles (19,404—*134,973*)—J. L. Scott.
Automobile radiators (18,997—*135,287*)—E. Tregoning.
Driving mechanism for motor vehicles (21,801—*121,965*)—E. J. Kane.
1919.
Change-speed mechanism (5,087—*124,423*)—A. Garelli.
Traction attachment for the driving wheels of vehicles (14,443—*127,832*)—F. Rightmire.
Means for lubricating wheels of tramway vehicles (1,611—*133,568*)—T. Abbott.
Rail joints (8,191—*125,374*)—H. V. Baints.
Anti-skidding devices for vehicles (5,612—*124,209*)—P. G. Lepage.
Automobile vehicles (236—*122,189*)—U. Pavesi.
Brake gear (574—*134,429*)—C. Markham.
Change speed gearing (12,933—*134,495*)—T. Lumsden.
Road wheels for motor vehicles (16,054—*134,503*)—F. W. Brampton
Flexible tracks for automobiles and like vehicles (1,119—*134,190*)—L. Renault.
Steering mechanism for vehicles (1,561—*134,706*)—A. A. Thornton (*Oshkosh Motor Truck Manufacturing Company*).
Method of and apparatus for controlling electrical energy in signalling systems and the like (4,286—*134,725*)—C. D. Ehret.
Change speed and reduction gearing (12,932—*134,776*)—T. Lumsden.
Planetary gear transmission mechanism for self-propelled vehicles (1,006—*135,036*)—Caterpillar Tractors, Limited (*Holt Manufacturing Company*).
Fluid pressure braking apparatus (7,311—*135,105*)—Westinghouse Brake Company (*Westinghouse Air Brake Company*).
Turning signal or indicator for use on road vehicles (13,287—*128,198*)—W. Hay.
Lifting jacks (15,396—*135,143*)—C. F. L. King.
Resilient wheels for motor vehicles (1,624—*135,370*)—W. H. Bailey.
Friction driving gears for motor cars (2,082—*135,377*)—A. G. Grice.
Electric motors for variable speed transmission (4,342—*135,392*)—H. H. Wright and T. Humphreys.
Friction change speed gears (9,371—*127,561*)—R. J. C. Tampier.
Speed indicators (9,711—*135,418*)—R. Berry and E. A. Lambert.
Differential gear for self-propelled vehicles (10,494—*135,421*)—J. C. Schulmayer.
Speed changing gear (16,145—*135,443*)—A. Garelli.
Change speed gearing (18,974—*135,450*)—J. Cotal.
Transmission mechanisms for motor vehicles (19,248—*131,287*)—R. D. Nuttall Company.

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TRAFFIC RETURNS.

Tramway and Omnibus Undertakings in the United Kingdom.

NAME OF COMPANY OR CORPORATION.	1918. WEEKS ENDED.					1919. WEEKS ENDED.					AGGREGATE.		
	Nov. 30	Dec. 7	Dec. 14	Dec. 21	Dec. 28	Nov. 29	Dec. 6	Dec. 13	Dec. 20	Dec. 27	Wks.	1919.	Increase or Decrease.
	£	£	£	£	£	£	£	£	£	£		£	£
Aberdare U.D. Council	499	508	509	520	593	597	580	585	494	622	38	21,180	+ 1,878
Aberdeen Corporation	2,392	2,534	2,454	2,506	2,532	3,034	3,068	2,930	2,950	3,081	29½	97,929	+ 19,991
Ayr Corporation	382	395	425	408	418	432	451	460	465	458	32	23,221	+ 4,445
Belfast City Tramways	8,115	8,688	8,986	9,203	8,499	10,126	10,183	10,197	10,663	9,923	39	401,394	+ 81,566
Birkenhead Corporation	2,140	2,207	2,202	2,258	1,965	2,825	2,872	2,931	3,035	2,742	38½	113,291	+ 27,545
Birmingham Corporation	23,103	24,092	25,061	25,719	22,016	25,951	26,980	26,979	27,551	23,038	39	1,005 981	+ 82,486
Birmingham Motor 'Buses	1,273	1,368	1,394	1,354	1,113	1,595	1,705	1,690	1,737	1,353	39	67,103	+ 9,908
Blackburn Corporation	1,488	1,498	1,618	1,670	1,864	1,913	1,925	1,952	2,031	2,201	39½	90,040	+ 18,708
Bradford Corporation	8,529	9,122	9,268	9,749	9,090	10,785	10,789	11,856	11,110	10,032	39	443,915	+ 81,843
Burnley Corporation	2,115	2,221	2,368	2,401	2,691	2,817	2,833	2,960	2,896	3,109	—	—	—
Burton-on-Trent Corporation	391	404	430	449	430	472	523	500	563	570	39	19,748	+ 3,702
Bury Corporation	1,793	1,932	1,918	1,916	1,931	2,105	2,067	2,048	2,055	2,014	38½	91,926	+ 11,969
Chatham and District	1,167	1,176	1,237	1,259	1,150	1,349	1,323	1,372	1,428	1,449	51	76,919	+ 10,999
Cork Electric	544	544	562	564	600	707	688	748	761	806	51	36.218	+ 4.708
Derby Corporation	1,361	1,443	1,499	1,557	1,471	1,854	1,921	1,894	2,057	1,925	39	75.766	+ 17,028
Dundee City	1,800	1,908	1,921	1,996	2,005	2,439	2,458	2,394	2,449	2,585	31½	81,505	+ 19,714
East Ham Corporation	1,510	1,648	1,643	1,676	1,637	1,853	1,881	1,870	1,889	1,757	37½	74,862	+ 14,230
Edinburgh Corporation	8.605	8,831	8.895	9,017	9,109	9,825	9,816	9,723	10.210	10.126	25½	282.151	+ 48.289
Glasgow Corporation	27,627	28.343	28,666	28,630	28,470	31,909	32,154	32,012	32,587	32,062	30	967,896	+ 109,576
Glossop (Urban Elec. Supply Co.)	174	194	196	220	210	220	215	212	231	228	52	11,609	+ 2,181
Huddersfield Corporation	3,641	3.588	3.605	4,713	3,855	4,549	4,713	4,714	4,709	4,549	39	190.174	+ 41,648
Ilford U.D. Council	934	998	1,017	1,070	1,015	1,073	1,115	1,111	1.179	1,092	38½	46.377	+ 7,458
Ipswich Corporation	570	617	675	728	663	795	830	779	854	866	39	36.346	+ 6,783
Isle of Thanet	270	259	301	318	342	484	431	456	449	568	12½	6.565	+ 2,809
Kilmarnock Corporation	260	276	279	272	291	267	280	273	288	294	32½	9,245	+ 750
Lanarkshire	3,455	3,329	3,609	3,490	3,474	3,753	3,784	3,762	3,819	3.989	51	190,295	+ 5,905
Leeds City	13,121	13.750	13,874	13,784	14,444	15.760	15.859	15.892	16,071	15,496	39	644.318	+ 120,228
Leicester Corporation	4,601	4,751	5.031	5,060	4,792	5,813	5,970	6,052	6,213	5.580	—	—	—
Leyton U.D. Council	2,290	2,391	2,461	2,533	2,628	2,727	2,689	2,759	2,851	2,846	40	123,128	+ 29,540
Liverpool Corporation	19.159	19.883	20.217	20,568	19,260	24,074	24,493	24,806	25.742	23.654	51½	1,164.622	+ 214,009
London County Council	66,245	67.670	69,769	71,503	69,173	76,601	74,702	76,688	78,350	84,936	38½	3,077.593	+ 550,330
Maidstone Corporation	226	250	261	283	298	346	333	330	347	382	38½	15.043	+ 4,045
Manchester Corporation	25.122	26.272	27.230	27.669	23,313	29,819	29,702	30.260	30.341	25.568	39	1,180,616	+ 169,763
Newcastle-on-Tyne Corporation	8,373	8.801	8.924	8,894	7,841	8,933	9,105	9,145	9,332	8,398	38	367.950	+ 17.608
Northampton Corporation	868	904	942	1.001	1.008	1,221	1,235	1,222	1,330	1,438	39	49,516	+ 15,562
Nottingham Corporation	4 934	5.416	5,555	5,782	5.658	6,989	6,878	6.933	7,110	6.876	39	277.538	+ 54,770
Oldham Corporation	3,121	3,364	3,506	3,497	3,363	4,220	4,222	4,325	4,277	4,334	38	176.824	+ 37,940
Reading Corporation	1,137	1,216	1.262	1,320	1,194	1,438	1,474	1,559	1,688	1,731	38½	61.702	+ 11,447
Rotherham Corporation	2,125	2.341	2,268	2,265	...	2,086	2,029	2,057	1,992	...	37½	78.624	— 8,926
St. Helens Corporation	...	...	...	...	...	1,519	1,485	1,519	1,513	1,563	12	18.813	—
Sheffield Corporation	12.709	13.136	13.034	12.960	11,551	16,496	16,335	16.468	16.598	18.132	39½	651.690	+ 121,929
Southampton Corporation	2,347	2,387	2,433	2,489	2,386	2,878	2,823	2,919	3,049	3,631	38½	105.650	+ 7,108
Southampton Motor 'Buses	...	...	...	...	...	163	158	162	168	201	21	2,894	—
Southend-on-Sea Corporation	1,033	1.042	1,073	1,128	1,140	1,338	1,286	1,332	1,299	1,627	39	83.770	+ 31,470
South Shields Corporation	1,024	1,081	1,114	1,108	1,046	1,421	1,377	1,406	1,445	1,356	39	55.705	+ 10.958
Sunderland Corporation	2,088	2,186	2,283	2,416	2,321	2,615	2,664	2,664	2,763	2,867	39	111.870	+ 27,556
Tyneside Tramways and Tramroads	828	881	912	878	813	997	982	956	959	1,068	26	30.711	+ 4,749
Wallasey Corporation	1,580	1.608	1,630	1,911	1,759	2,135	2,145	2,155	2,245	2,089	38½	98,135	+ 25,112
Walsall Corporation	1,152	1,243	1,265	1,314	1,457	1,553	1,591	1,583	1,651	1,748	39	58.146	+ 9.828
Walthamstow U.D. Council	1,297	1.341	1,387	1,499	1,476	1,516	1,505	1,552	1,594	1,680	39	66,919	+ 10.508
Warrington Corporation	756	802	814	841	911	926	908	937	952	1,004	38	34.638	+ 4,883
West Ham Corporation	4,525	4,680	4.819	5.072	5,068	5,054	5,121	5.205	5,395	5,173	38½	207.504	+ 30,547
Wolverhampton Corporation	...	1.593	1,524	1,756	1,800	...	2,146	2,201	2,321	2,748	38	79.010	+ 13,441

*** A number of undertakings suspended the issue of traffic returns for the duration of the war.

Colonial and Foreign Tramway Traffic Returns.

NAME OF COMPANY.	1918. WEEKS ENDED.					1919. WEEKS ENDED					AGGREGATE.		
	Nov. 30	Dec. 7	Dec. 14	Dec. 21	Dec. 28	Nov. 29	Dec. 6	Dec. 13	Dec. 20	Dec 27	Wks.	1919.	Increase or Decrease.
	£	£	£	£	£	£	£	£	£	£		£	£
Anglo-Argentine	58,080	59.964	63,629	59,081	61,698	69.385	68.539	68,920	71.541	70,086	51	3.047.777	+ 180.498
Calcutta Rs.	86,469	82.145	82,713	82,734	...	94,402	97,181	97,564	90,271	...	50½	—	+ 579,473
Madras Rs.	...	...	...	...	...	...	...	...	...	...	—	—	—
Pernambuco	4,793	5.255	5,178	5,235	5,961	7,800	7,920	7,950	7,800	8.859	51½	290.826	+ 60,120

Companies issuing Monthly Statements only.

	1918.						1919.						Wks.	AGGREGATE.	
	July	Aug.	Sept.	Oct.	Nov.	Dec	July	Aug.	Sept.	Oct.	Nov.	Dec.		1918-19.	+ or —.
	£	£	£	£	£	£	£	£	£	£	£	£		£	£
Ballarat & Bendigo	2,948	2,996	3,430	3,691	3,570	...	2,981	2.192	3,396	4,176	4.243	...	32	27,806	+ 714
Brazilian Trac. Mlns	9465000	9491000	9081000	8052000	7581000	...	10070000	9734000	9792000	9980000	9796000	...	47	103335000	+ 9,972.000
Brisbane	36,360	42,670	35,400	...	...	...	41,610	42,245	41,970	...	...	...	39	346.370	+ 20,516
British Columbia $	413,968	544,339	575,476	580,354	...	...	642,090	667,170	684,946	710,405	...	...	17	2,704,611	+ 590 474
Buenos Ayres L'c'z.	41,145	40,006	...	41.843	42,952	50.460	45.222	45,310	...	49.692	50,635	55.873	26	293,577	+ 34,352
Burma	34,848	41,855	30.836	34,848	34,408	...	44,045	43,683	43,152	51,898	46,755	...	17	185.488	+ 43,541
Cape Town	18,409	...	...	...	...	...	12,792	...	19,759	...	...	...	—	—	—
Carthagena & H.	5,491	2,729	2,549	2,525	2,988	2.950	4,183	2,991	1,539	1,465	2,549	2.923	52	32,441	— 14,423
East India	1,968	1,975	1,939	2,044	1,942	2,048	2.687	2,761	2,831	2.855	2,709	2,916	21	14,072	+ 4,119
Kalgoorlie	2,798	3,340	...	...	...	...	2.815	2.876	...	...	...	...	34	21.533	— 590
La Plata	6.721	4,382	4.999	5.177	5,334	5.792	5,317	5,729	5,540	6,196	6,240	6,324	52	69,804	+ 7.185
Lima	45.964	44,720	42,838	...	...	...	49.025	48.923	48,780	...	...	...	39	429.635	+ 39,887
Manila	$189,800	200,000	204,500	214,898	...	...	189,573	193,841	223,048	241,949	...	...	43	2.075.148	+ 208,969
Monte Video	31,684	16,937	29,611	...	...	...	34,139	34.873	35,552	...	...	...	47	404,501	+ 57,428
Para	24,398	24,672	23,442	22,442	19,765	...	24,659	24,890	24,386	27,849	25,422	...	52	299.283	+ 15,028
Peruvian	$987.300	...	...	...	...	...	1058730	...	...	...	...	...	—	—	—
Port Elizabeth	3.395	...	...	...	...	...	3.247	...	4.372	...	...	...	—	—	—
Rangoon	6.054	5,760	6,067	6,566	6,611	...	6,562	6.472	6.812	7,679	7,379	...	47	73,530	+ 7,726
Toronto	$1049936	1070567	1119925	1048478	...	...	977.262	1083741	1124159	1123801	...	...	43	10 442.259	— 202,816
Winnipeg	$288.155	288,974	285,670	295.005	...	...	337,978	353,194	381,248	428,339	...	...	43	3,375.399	+ 406,257

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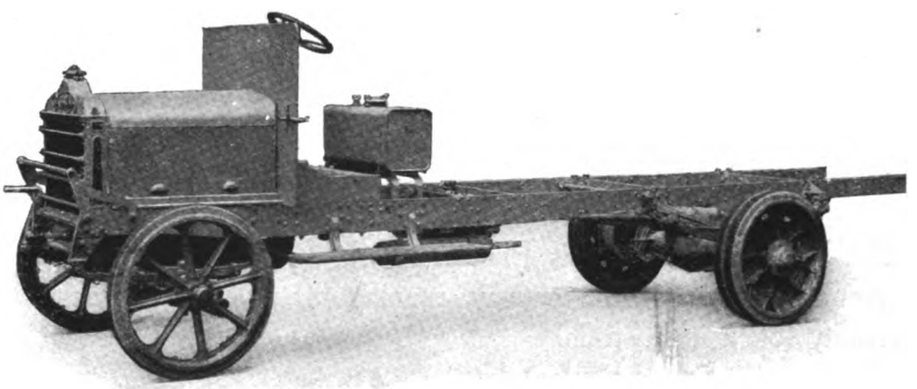

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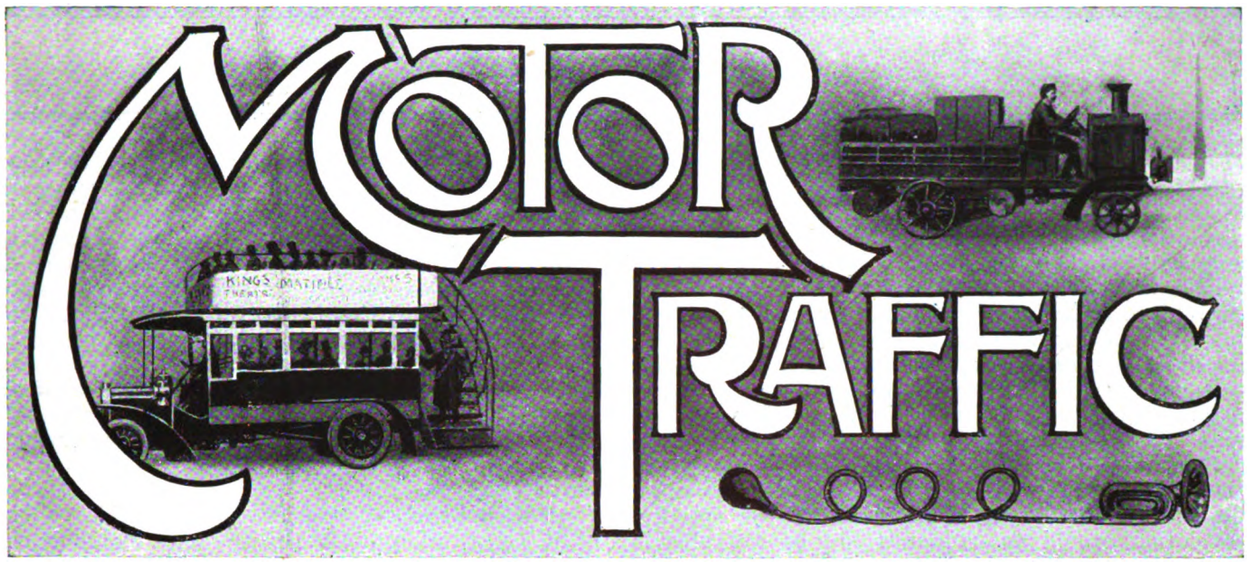

THE FUTURE OF TAXATION.

While the petrol tax is probably viewed by motor owners with very little more favour than is the income-tax by the average individual, the decision of the Chancellor of the Exchequer to abolish the petrol tax is by no means acceptable. The reason is that its abolition is to be accompanied by the imposition of a new duty calculated to bring in an equivalent revenue. We are nearly all agreed that, if we must be taxed at all, the petrol tax affords the fairest basis, because it reflects the actual use made of the road by the vehicle. Fuel consumption increases with vehicle weight, with speed, and with mileage. It goes up also if the tires used are not resilient and the springs are inefficient. Everything, in fact, which is likely to increase the road wear due to the use of the vehicle is also likely to increase the amount payable under the petrol tax. In this respect the duty is at least equitable. Admittedly it has grave faults, because it bears only upon vehicles with internal combustion engines, and therefore in any really fair system would need to be supplemented by some sort of licence duty payable in respect of steam or electric vehicles. The official objection to the tax is, however, ostensibly based upon the difficulty and cost of collection and the opportunities that exist for evasion, particularly by the use of the heavier fuels, the taxation of which is not practicable. We do not consider that the objections are in fact nearly so strong as those which can easily be formulated against any other system of taxation of motor vehicles. Doubtless the decision against the petrol tax has been in some measure the result of the assiduous representations of petrol importers, largely due to the fact that home-produced fuels are not taxed. With the abandonment of the petrol tax, preferential treatment of home-produced fuels will presumably cease. The result of this is already becoming evident in advance in the rapid decrease in the production of benzol. Without the petrol tax petrol importers will almost certainly be able to undercut home-produced fuels without seriously inconveniencing themselves, and so to re-establish the monopoly threatened by the increase in benzol production during the war. For this reason in particular the abandonment of the tax is a very short-sighted policy. Apparently, however, we must face the fact that the decision has been reached and some alternative must be found. It is instructive to note that on January 12 there happened the reverse of what had been predicted if the tax were abolished. The price of petrol rose fourpence per gallon.

ALTERNATIVE TAXATION PROPOSALS.

The general opinion appears to be that the best alternative in respect of commercial motor vehicles is taxation on the basis of unladen weight. There are difficulties about this scheme, particularly in view of the fact that the registered weight upon which taxation is based may become incorrect if any new fittings are added or if the bodywork is strengthened or altered. Then there are doubtful points as to what should or should not be included as part of the unladen weight. Unladen weight is limited by law, and the definition for the purpose of this limit should preferably be the same as that arrived at for the purpose of taxation. Probably the best definition from this point of view would be that unladen weight should include everything but the useful load of goods or passengers. If this were settled, then the legal limit of unladen weight would need to be very appreciably increased. In arriving at a proper scale of taxation we should require to take into account not only the weight, but the probable annual mileage of the vehicle, or at any rate the comparative speeds and mileages of vehicles of various load capacities. Having arrived at a reasonable average mileage for each class of vehicle, we should in each case multiply the mileage by the unladen weight, and the resulting figures would then be in the same proportion to one another as the fairest taxation of the different classes of vehicle. Taxation on this basis might be payable in a lump sum annually, or optionally by quarterly instalments. This taxation would not be really fair, since the vehicle used over a small mileage would have to pay just as much as one used for a large mileage. This would, however, at least have the effect of encouraging users to employ their vehicles fully and regularly, and the influence of this encouragement upon economy of transport should be good.

TAXATION BY POWER.

For the lighter classes of motor vehicle, taxation by weight would hardly be practical, and we are therefore forced to consider a scale of duties based upon estimated horse-power. Such duties are, of course, already imposed in respect of private cars in addition to the petrol tax, but if the latter were abandoned the amount of duty payable would have to be materially increased. Thus it becomes more important than ever to arrive at some formula for horse-power which, while simple, is not likely to have the effect of encouraging abnormal design. The present formula is faulty inasmuch as it takes no account either of the stroke

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MOTOR TRAFFIC

of the pistons or of the speed of revolution of the crankshaft. Thus it encourages more or less the design of engines of long stroke with a high rate of revolution giving considerable power, but nevertheless only liable to pay a low tax. So long as duties are small in amount it is not likely that designers will allow themselves to be influenced much by such considerations, but if duties are made very considerable then it will be a strong selling point if a car comes into a low category. From the standpoint of taxation, many manufacturers and others believe that it would be much fairer to adopt a new formula indicative of the cubic capacity of the engine; others would prefer the old formula to be retained. A really comprehensive formula, taking into account also the speed of revolution, would unfortunately not be workable in practice. The whole of this question of taxation is now under consideration by a representative Committee constituted by the Minister of Transport, and at the moment it appears most probable that this Committee will advise the taxation of private cars on the basis of the present horse-power formula and the taxation of commercial vehicles on the basis of unladen weight with an additional tax if steel tires are employed.

AMENDMENT AND SIMPLIFICATION OF MOTOR LAW.

The Ministry of Transport will also presently take in hand the matter of bringing up to date, and presumably consolidating into one Act, the various laws affecting the design and use of motor vehicles. Referring particularly to heavy motors, it is quite obvious that regulations framed some fifteen years ago must now need considerable amendment. Tremendous advance has been made since those days. Vehicles are under far better control, are much more reliable, are better sprung, and run more smoothly. Consequently provisions that were at one time desirable either to prevent wear of the roads or to ensure the safety of the public can and ought now to be modified. Speed limits should on the whole be increased; so also should axle weights and the legal limits of laden and unladen weights. The opportunity arises, if it is deemed advisable, to give very definite encouragement to the more extensive use of rubber as against metal tires. The practical enlargement of the load capacity of vehicles by the wider use of trailers deserves stimulation. The whole law, in fact, requires revision owing to our changed standpoint. A few years ago the great consideration was assumed to be the protection of the roads from wear. Now we know that the primary consideration is the provision of adequate transport facilities working as economically as possible. From the point of view of those who conduct transport by means of road vehicles, the efficiency and impartiality of the new Ministry will be very largely gauged by the intelligence and breadth of the changes which it must certainly introduce in motor law at no distant date.

FUEL PRICES.

The question of fuel prices and their justification or otherwise is now under consideration by a Committee appointed under the Profiteering Act. In some quarters it is considered that the price of benzol as well as that of petrol could be very appreciably lowered, but this is hardly borne out by the undoubted fact that many producers of benzol are giving up that business as being insufficiently profitable. The removal of the petrol tax will be a further blow to benzol production, because it will eventually reduce the margin of cost, having due regard to the practical value of the two spirits. Certainly benzol was priced at a shilling a gallon during the war, as it was before the war, but this was merely an arbitrary price insisted upon by the Government, and took no account of the great rises in the cost of production. The recent lengthy tests of benzol in vehicles upon the road have served to emphasise the admirable qualities of the standard fuel now obtainable, and it would be a thousand pities if the production is discouraged.

MOTOR RESEARCH.

All users of motor vehicles should be glad to learn of the constitution by the British motor manufacturers of a Research Association under the scheme approved and financially assisted by the Government. The leading manufacturing concerns have, of course, for many years past maintained research departments of their own, but this does not in any way lessen the need for co-operative research by the industry as a whole. Broadly speaking, problems connected with motor design and construction may be divided into two sections, namely, the big basic problems, the solution of which is valuable to everybody; and the more specialised problems which really amount to applying the result of fundamental investigations to the design of any specific vehicle. The latter is the business of the individual manufacturer, the former is likely to be neglected unless financed by some central scientific body. The new Research Association, of which some particulars are given on a following page, is already definitely assured of the active support of most of the leading manufacturers for a term of at least five years. It will have at its disposal an income of certainly not less than £8,000 to £10,000 per annum. The expenditure of this sum will be controlled by the best scientific and commercial brains in the industry. We cannot expect the results to be instantaneous, but we can certainly anticipate that in the course of two or three years all the firms co-operating in this matter will be in receipt of information resulting from research such as to enable them to make material advances in design and construction. Thus the Research Association is calculated to enable the British motor industry to increase its lead over its competitors, certainly as regards the quality and dependability of the product. Doubtless, also, the improved information available will render possible very considerable economies in manufacture. Thus the user may look to the Research Association to be the instrument for providing him presently with better machines than have ever hitherto been at his disposal. The opportunity afforded to the manufacturers is a magnificent one, since the Government will pay something approaching half the cost of all the research work carried on. With such an inducement we may fairly assume that all progressive manufacturers will support the movement, and if users or prospective users wish to know which members of the industry are really making every effort to progress, they will have a fairly reliable guide in the list of members of the Research Association. Incidentally, the motor industry ought to be congratulated upon being the first branch of the British engineering industry to constitute an approved association for co-operative research.

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MOTOR TRAFFIC

PRODUCER GAS FOR MOTOR VEHICLES.

EXTRACTS FROM A PAPER BY LT.-COL. D. J. SMITH.

At the fifth meeting of the session of the Institution of Automobile Engineers, held on January 7 at the Institution of Mechanical Engineers, Storey's Gate, S.W., Lt.-Col. D. J. Smith, a member of the Council, read a paper entitled "Producer Gas for Motor Vehicles." He said, in part:—The production of internal combustion engines using liquid fuel is rapidly outpacing the supply of fuel necessary to run them. With vehicles using petrol the fuel costs can, apart from a lower price, only be reduced by a greater economy in use. This does not appear very probable, as the internal combustion engine seems to have reached the limit of its economy for commercial work, and further savings can only be looked for in the direction of reducing the vehicle weight in proportion to the load carried.

Solid fuels present the only method whereby the high cost of liquid fuels can be countered, and these can be used without destroying any material from which liquid fuels might be extracted. For instance, coke, charcoal, and dried peat represent the residue left after the liquid fuels have been extracted, so the utmost value is got out of the material used in providing fuel for both light and heavy motor vehicles. In the case of anthracite, there are practically no volatile constituents, so this fuel, if used directly, entails no loss to the liquid fuel supply. The utilisation of 10 cwt. of coke used in a vehicle fitted with a portable producer gas plant would give over double the mileage obtained from the direct combustion of one ton of coal, which in addition causes the loss of all its valuable volatile constituents

The stumbling block up to the present has been the producer, and it is to the method in which the producer has been modified for use on motor vehicles that the author proposes to devote himself in this paper. The main advantages and disadvantages of producer gas as a fuel for vehicle propulsion may be stated:—

ADVANTAGES.

(1) It allows the use of home produced fuels, fuels, moreover, of which some are regarded at present largely as waste products, such as anthracite duff. Non-caking bituminous coal or coke can be used, but as there are many uses for them, while there are few for the duff, there is no reason to use any other, so long as it is available at low prices. (2) It is safe, and eliminates all chances of fire, and would greatly reduce the insurance premiums on vehicles and garages. (3) Compared with coal gas, it does not call for labour in its preparation, or the consumption of fuel of commercial value in its production. (4) It eliminates the perishable gas bag. (5) It allows a vehicle to travel the same distance as on petrol without taking in fresh fuel. (6) It is a fuel of almost unvarying quality, and eliminates mixture troubles and the need for more or less troublesome mixing valves. (7) It is the cheapest source of power which can be adapted to motor vehicles known at present, and with coal at 40s. per ton is equal to petrol at 2½d. per gallon when used in the same engine. (8) It is lighter than a compressed gas installation, and occupies less room, and eliminates expensive compressing costs. (9) It requires no pressure, and there is therefore no danger. The pressure in the plant is always less than atmospheric, so if there is any leakage it is of air inwards.

DISADVANTAGES.

(1) The time taken to start from cold; this averages from 15 to 20 minutes, but the fire will keep alight all night if desired, and can be ready for a start in about four to five minutes the next morning. (2) The weight of the plant over and above that of the fuel, which for a 50-H.P. engine is about 2 cwt. The tare of the average 3-ton lorry is about 3 tons 15 cwt., so this is not a high proportion. (3) The necessity for an occasional cleaning of the plant. This involves a wash out of the scrubber every morning, which takes about five minutes, and can be done while the fire is being lighted, so means no loss of time. The plant should be started up in a well-ventilated space, as the gas is harmful if inhaled in quantities for any length of time. Once the plant is going, there is no escape of gas. (4) The time, three or four minutes, taken to start after any lengthy stoppage. (5) An increase of 75 per cent. in weight of fuel (including water) to cover any given distance, as compared to petrol, unless the engine is adapted to give higher initial compression, in which case the disparity in weight is considerably reduced.

ADAPTATION OF GAS PRODUCERS.

With such a great disparity in the prices of the fuels, the petrol vehicle, even with its much more economical prime mover, cannot compete with the steam vehicle in cost of fuel. By the use of producer gas the internal combustion vehicle is able to use the same fuels as the steam vehicle, and, owing to its higher efficiency, to consume far less in proportion to any given work. The author quoted figures to show that by using producer gas in an internal combustion engined vehicle the steam vehicle is no longer the cheapest in fuel cost, although the fuel for the producer gas vehicle is taken at a higher figure, the current market figure at this time. It is in the weight of fuel, however, that the greatest saving is accomplished; the steam vehicle uses about nine times greater weight of fuel per mile than the producer gas vehicle. Assuming a journey of 100 miles, the steam vehicle would have to carry over half a ton more fuel than the producer gas vehicle. The producer gas method of propulsion is accompanied by the following advantages in the wording of the Inter-Departmental Committee on Gas Traction (1919). (1) Lowest known fuel cost. (2) Large radius of action without recourse to compression or the use of containers as with coal gas. (3) Use of home produced solid fuels. (4) Low cost of upkeep.

The method in which it may successfully be applied can now be dealt with. Failure to adapt gas producers to motor vehicle work has chiefly been due to the fact that the stationary plant has been taken as a basis, and every effort has been concentrated on reducing it in size and weight, while the features which render the ordinary producer impossible for motor vehicle work still remained. The fuel bed in an ordinary producer is divided into zones:—(1) Ash zone, (2) combustion zone, (3) decomposition zone, (4) distillation zone. The second zone is the one in which the actual work is done, the rest give trouble, especially the first and fourth.

The author therefore built a producer in which only the combustion zone existed. To keep this thin bed of fuel wholly as a combustion zone, and to maintain its shallowness, two things were necessary. (1) A regular feed of fuel in small measured quantities; (2) continuous agitation of the whole fuel bed, in order that no channels or holes in the fire may occur and that all ash may be constantly sifted out, and the fuel bed kept light and porous to give easy passage to the air and water vapour through it. The depth of the furnace chamber in the producer was approximately 12 in., the depth of fire being only about 6 in., all of which, while working, was incandescent.

Since the fresh fuel was regularly fed, it was at once sifted into the incandescent mass of fuel, and all volatile constituents were eliminated, the hot zone above the fire in the producer chamber dealing with those not broken up in the fire. This method of working eliminated the drawbacks due to the distillation of the fuel and the passing over of any volatile constituents which could give trouble in the engine, and not only could anthracite be used, but also other fuels containing a fairly high percentage of volatile constituents. It is generally regarded as impossible to work a suction gas producer successfully with such a thin bed of fuel, but it works extremely well, and after severe tests has shown no drawbacks. This method of working also eliminated another serious trouble found with a deep fire bed, namely, clinker.

The feed and grate mechanism were driven by the engine of the vehicle, and a mechanical ash discharge was also added. This enabled the size of the producer to be further reduced by doing away with the necessity of providing an ashpan large enough to contain the ash formed during some hours' running. The necessity for stopping the engine to clear out the ash was also eliminated. Several important advantages resulted:—(1) A reduction in size and weight due to the small quantity of fuel carried in the producer. (2) The elimination of distillation of the fuel with all its troubles. (3) The prevention of clinker. (4) A self-acting fuel feed and ash discharge.

The results of the author's early experiments showed that water could not be directly fed to the fire if the best results and extreme flexibility were required, so that it must be fed as steam, and that in order to keep the quality of the gas constant, the air passing to the producer must be used as the regulating medium for the steam supply. A small vaporiser or boiler was therefore fitted to the producer heated by radiation from the fire and the passage of gas through a channel formed in it.

SCRUBBING OR FILTERING OF THE GAS.——MIXING VALVES.

Until the invention of a producer which gives a gas free of all volatile constituents in the fuel, the scrubbing of the gas was the greatest difficulty in the way of adopting producer gas to motor vehicle work. With a gas free from all tarry or condensible constituents, it is merely necessary to remove the dust held in suspension, and this is a very much easier task than scrubbing in a wet scrubber. The author thought it better not to rely upon any arrangement which called for renewal or cleaning at long intervals, but to insist on a daily clean out of the filter. It was essential that this should not demand any skill or require much time or trouble in opening up the scrubber and filter, and the arrangement fulfils these conditions.

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MOTOR TRAFFIC

The material found in the filter is merely the fuel dust, which is quite dry and clean, and no trace of any tarry substance likely to cause trouble with the engine has been found. For use with petrol engines having enclosed valves, some further filtering may be necessary owing to the very small clearance in the valve stems. For this purpose the gas, after leaving the scrubber, can be taken through a small water seal, the gas-pipe from the scrubber dipping about 1 in. or 1½ in. under the surface of the water, and the level of the water being maintained by a float chamber. The consumption of water would be very small, and, except for very long runs, no extra supply would be required and the float feed could be dispensed with.

It was no easy matter to discover the best type of mixing valve or gas carburetter for producer gas used in an engine running at widely differing speeds and loads. The author finally adopted an arrangement in which no mixing valve as such was employed. This device, while not perfect, answers remarkably well, is extremely simple, and cannot get out of order. Variations in the fuel can be met by adjusting the tension of the spring on the automatic valve, an operation which takes a few seconds only. The design of producer gas mixing valves or carburetters will no doubt receive considerable attention, and the author would suggest this as an interesting field of research.

The refractory lining of the producer for motor vehicle work is a very important subject, and one to which the author devoted much time, the experience gained with stationary plants not being of much use. The author therefore adopted a comparatively thin lining—1½ in. thick—and found this quite satisfactory, and owing doubtless to the comparatively rapid passage of heat through this small thickness, its life was far longer in proportion than the usual thick lining. In order not to lose the heat conducted through the lining, the author jacketted the outside of the producer casing with another case, leaving an annular space between.

Position of the Producer.—Design of Vehicles.

As it is now possible to reduce the size and weight of the producer plant to the figures given by the author, it is not necessary to encroach on any useful space or the driver's accommodation, and the producer can be fitted in the position shown in Figs. 1 and 2, and in the few cases where the driver's seat is placed on one side of the

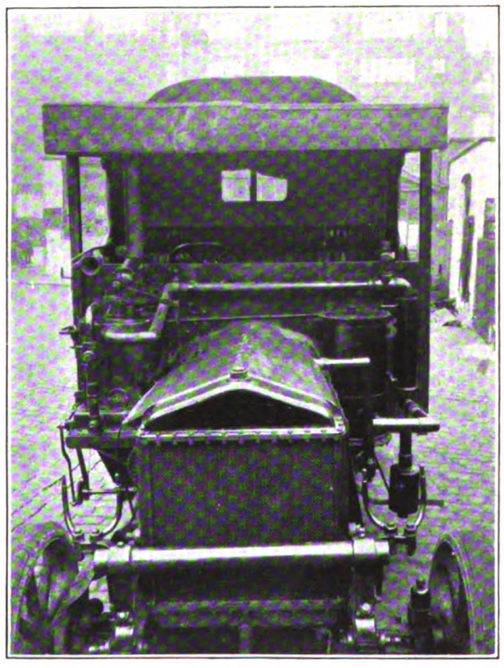

Fig. 1.—Smith Producer Shown Fitted to a Lorry.

No encroachment on the loading space or driver's accommodation. The fuel pipe leading from the hopper in the canopy to the producer is shown.

bonnet, the producer could be fitted on the other. The plant will then be under the constant observation of the driver, and although practically no attention is required after once starting, he will be able to see that the functions of the producer are being carried out. If necessary, the producer could be put under the bonnet. The canopy over the driver's head will accommodate a fuel hopper capable of holding enough fuel for a day's run, and here again no useful space is occupied. In fact, unless the fuel hopper is pointed out, it is not noticeable. The water for the producer can be carried in the space occupied by the petrol tank under the driver's seat or in the part of the canopy not occupied by the fuel hopper. The

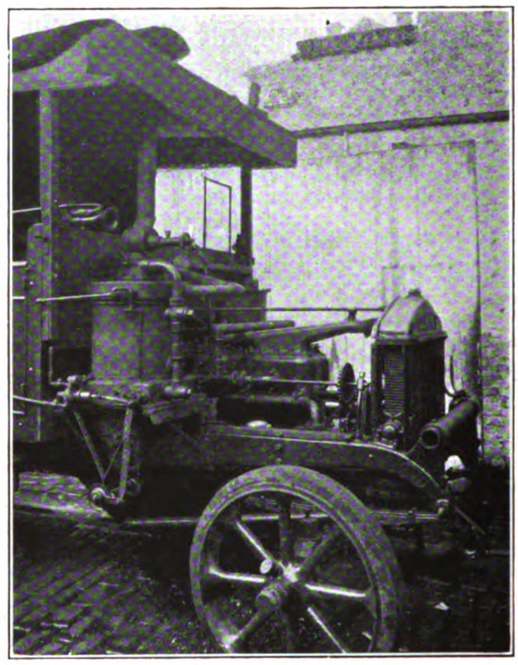

Fig. 2.—Showing Method of Drive from the Engine to the Producer.

Freedom of access to the engine is not interfered with.

pipe conveying the fuel to the producer presents no obstacle to the driver's view, and has a slot running down its length by which he can constantly watch the feed of fuel. Little or no heat is noticeable from the producer when running. The asphyxiation of drivers, which was often prophesied, has not yet occurred, and if it is remembered that while running there can only be leakage of air into the plant, not leakage of gas from the plant, it will be appreciated that no danger can arise. By carrying the discharge pipe above the canopy, all fumes, gas, etc., when blowing up or standing, can be conducted above the top of the vehicle. For public service work this is the only possible position for the producer in the author's opinion, as it leaves the whole of the body entirely free, and there is no possibility of any discomfort being caused to passengers, as nothing in connection with the producer need be behind the dashboard.

Producer gas as a fuel offers so many advantages that it is essential to consider the design of a vehicle to use this fuel, as if it is used in engines designed for petrol the best results cannot be obtained, and its use is likely to prove disappointing. The chief alterations would be in the design of the engine. Using a cheap fuel, the need for a small high-speed engine for commercial work vanishes to a large extent, and it is possible to consider a large comparatively slow running engine having the long life and low upkeep cost of a stationary engine. The increase in weight would not be considerable, and it should be noted that the author in the comparison in running costs between petrol, steam, and producer gas vehicles has allowed 10 cwt. for the increased weight of such a vehicle, including the producer. An example of what the author has in mind in heavier vehicles is the action now being taken by a well-known firm, which is fitting the chassis of a steam lorry with a gas engine and his producer. This is a combination of well tried and proved units, and the result of the assembly should prove very satisfactory, and allow of heavy loads being conveyed at a lower cost, without the disadvantages of short water range and heavy fuel consumption of the steam vehicle. These are, however, matters for the designer to work out, but the engine details include no experimenting.

Owing to the very great saving possible in fuel cost by the use of producer gas, many existing petrol vehicles will no doubt be

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adapted for its use, and unless this is properly done the results will be disappointing, if not absolutely unsatisfactory. A new and larger engine is the only remedy with many vehicles, as they are underpowered on petrol. This may seem a very expensive alternative, but it must be remembered that by the use of producer gas it has been found possible to save over £30 in fuel for 1,000 miles' running. With many makes it is possible to instal producer gas without alteration, and for the vehicle to perform its normal work with only a slight loss in speed over a give-and-take road, while in level districts producer gas could be used without any difficulty on any vehicle designed for petrol. The results (as tabulated by the author) with petrol vehicles are sufficiently good to encourage the production of a vehicle designed for the use of this fuel, which removes one of the greatest handicaps to the developnemt of road transport—dear fuel.

UPKEEP.

The upkeep cost of the producer is a point which is frequently raised. The working parts or parts liable to need renewal are the firebars and the refractory lining. The mechanically-operated parts of the producer, owing to the very low speed, will seldom require attention during the life of the vehicle, but the lining and firebars require periodical renewal. The cost of fitting a new lining is made up chiefly of the labour involved in the taking down and re-erection of the producer. A lining should run approximately 10,000 miles, which can be taken as a year's work for the majority of lorries, and a set of firebars should have the same life. The cost of fitting the new lining would be about £2, including the lining; the cost of the new bars per set would be approximately 15s., though a whole set is seldom required. As the bars can be fitted without dismantling the producer, little labour cost is involved.

ROTHERHAM FARES.—The Tramways Committee have reported that the application to the Minister of Transport for an order to increase the present authorised maximum car fares by 50 per cent. had been limited to the trolley vehicle system.

TOP COVERS FOR OMNIBUSES.

EXAMPLES FROM NEW YORK, CHICAGO AND LONDON.

The problem of finding a suitable top cover for omnibuses, to which some attention has been given in this country, would appear to have been solved in Chicago and New York, judging by the accompanying photographs. The view of the New York omnibus, however, affords no justification for the statement made on this side of the Atlantic that "passengers can sit with just as much comfort on the top as they do downstairs." Side curtains would have to be provided for that assertion to be accepted.

A commendable feature of the cover is the provision of lights of mica in the front. The vehicle, too, provides better shelter for the driver and more effective ventilation of the saloon than is the case with London omnibuses.

Apropos of the formidable looking Chicago vehicle, the following extract from a letter written by Mr. W. T. Robson, late manager of the Southampton Corporation Tramways, is of interest, the writer being now on a visit to the U.S.A. and Canada. Mr. Robson says:—"The street railway managers are much interested in English operation and it is most noticeable, especially in view of the long reign of the single deck car, that the recent introduction of double-deck omnibuses in Chicago and New York should have created strong Press agitation for more open-top riding facilities. Mankind is never satisfied."

Top Cover in Use on Omnibus in New York City.

The nearest approach to a suitable top cover in London was introduced as an experiment in September, 1915, by Mr. F. Beck, of the Willesden Paper and Canvas Works, Willesden Junction. This cover was made to fold up on the canopy over the driver's seat when not in use, but when folded it was open to the objection of partly obscuring the destination board. The invention was to have been submitted to the Public Carriage Department of Scotland Yard for approval, but apparently no announcement has been made as to the verdict. Illustrations of the London and Chicago covers are shown on the following page.

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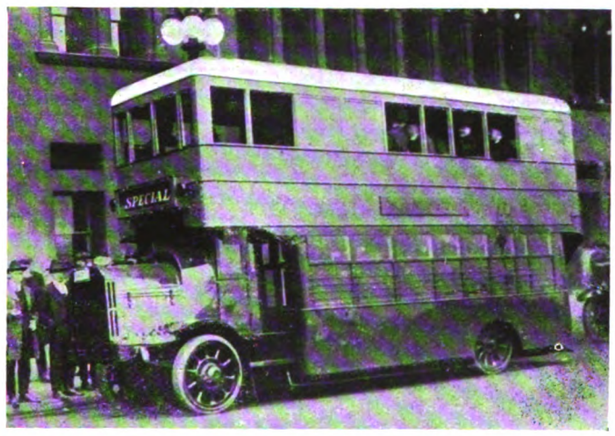
On November 16, 1916, when a second demonstration of the Beck cover was given in the presence of representatives of the General Omnibus Company, the National Steam Car Company, the British Electrical Federation, the London and North Western Railway

The Beck Omnibus Cover Lowered.

Company, etc., our representative was informed that steps were being taken to obviate the objection concerning the obscuration of the destination board. The hood, however, while keeping the passengers quite dry, was still not free from draught, due to the open front.

With the hood raised there was a height of 6 ft. covered in, the total height of the vehicle being 14 ft. 6 in., thus permitting it to pass under most bridges. Notwithstanding its somewhat cumber-



A Chicago Top-covered Omnibus.

some appearance, the Beck hood could be raised or lowered in 30 seconds, and as the Willesden canvas of which it was constructed was waterproof, it could be folded wet without risk of damage.

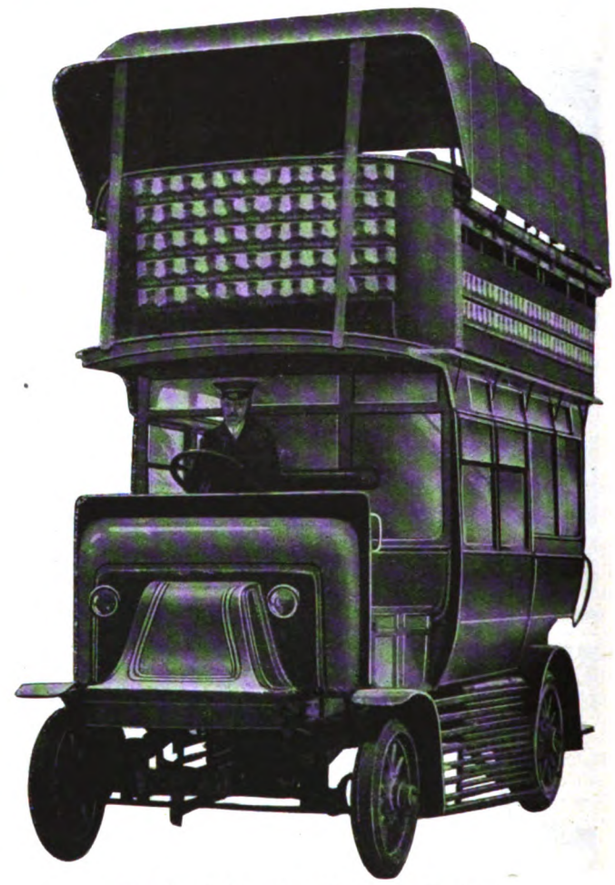
BRADFORD RETURN LOAD BUREAU.

The example of Manchester and Liverpool Chambers of Commerce in instituting return load bureaux for motor vehicles has been followed at Bradford. The organisation came into use on January 1. Its object is to arrange for loads on the outward and return journeys, thus reducing rates of carriage, and to ascertain what are the minimum costs of transport with a view to standardising rates for various classes of goods.

NATIONAL STEAM CAR COMPANY.

PROVINCIAL SERVICES' BRIGHT PROSPECTS.

In proposing the adoption of the report at the ninth annual meeting of the National Steam Car Company, Limited, Mr. K. P. Hawksley (chairman) stated that it was proposed to pay a dividend at the rate of 10 per cent. per annum, less income-tax. The results obtained for the past year had not been unsatisfactory having regard to the many difficulties. At the beginning of the period under review there were indications of a profitable year in front of their London business, with cheaper fuel, higher fares, and settled labour conditions. As many omnibuses as possible were placed on the streets, the number running being gradually increased from about 90 in December, 1918, to 130 in April, 1919. In the early spring, however, representations were made in certain quarters against the fares that were being charged, with the result that it was im-



The Beck Omnibus Cover in Position.

possible to get a proper readjustment of fares such as was justified by the continuous increases in expenses. Then came the award for an eight-hour day for the same pay as was given for the twelve-hour day, and, with other increases granted between December, 1918, and April, 1919, this involved an additional expenditure on 130 omnibuses for twelve months of £40,000, or a sum sufficient to pay a dividend of 15 per cent. on their capital. Further, the anticipated reduction in the cost of paraffin failed to materialise to any extent, and the prices had risen materially this month. Finally, in October, the drivers and conductors were awarded a further increase of wages, and that was the last straw in compelling the Board to the decision that they were no longer justified in jeopardising the financial stability of the company by running through the winter months at very heavy losses. Fortunately they had been able to dispose of the garages at Peckham and Putney on very satisfactory terms, and they were thus able to close the London services before the losses had accumulated to any grave extent. Their experience with the provincial services had been very encouraging.

It was decided to change the name of the company to the National Omnibus and Transport Company, Limited.

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SOME DENNIS LORRIES.

With the considerable extensions of the factories of Dennis Brothers, Limited, at Guildford, and of the housing accommodation for their employees that were made during the war to enable the firm to cope with he demands of the Government, the production of commercial vehicles and fire engines is greatly in excess of the pre-war rate.

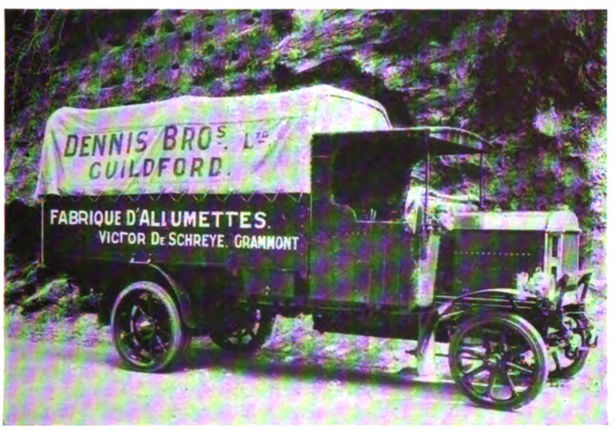

Fig. 1.—First Dennis Post-War Lorry Shipped to Belgium.

Fig. 1 is an illustration of the Dennis standard production—high fixed sides and hoopsticks for the covering. This vehicle was the first to be shipped to Belgium for business use after the war.

An example of the Dennis hinged side lorry of standard design is shown in Fig. 2, which has the War Office pattern chassis. These lorries have recently been supplied to numerous well-known firms, including Messrs. Whitbread and the Winox Wine Food Company.

Fig. 2.—Dennis W.O. Chassis with Hinged Sides.

In Fig. 3 is shown a high hinged sided wagon with detachable hoopsticks for the covering, this vehicle being built for Messrs Carreras, the manufacturers of Black Cat cigarettes.

B.E.T.C. Omnibus Service.—A service of four vehicles between Chorley and Preston has been instituted by the British Electric Traction Company.

Alcohol Derived from Coke.—According to a report made to a meeting of engineers at Cleveland on December 15, Mr. E. Bury, an engineer at Skinningrove Ironworks, has succeeded in extracting alcohol and its derivatives from coke-oven gas on a commercial scale. If applied to the whole of the coal carbonised in Britain, the process was estimated to yield 50,000,000 gallons of motor spirit a year, and would revolutionise the position of the country in regard to the supply of liquid fuel.

NON-SKIDDING TIRES.

An Experiment by Mr. Worby Beaumont.

At a meeting of the London "Safety First" Council on December 15, the subjoined memorandum, prepared by Mr. W. Worby Beaumont, was considered, and it was resolved to invite the attention of manufacturers of tires for self-propelled vehicles to the necessity for an efficient non-skidding tire, and to further experiments in this connection.

Being interested in road surface maintenance as well as in everything relating to motor vehicles, I have always objected to steel-studded tires as destructive of road surfaces and as an admission of a defect in motor vehicles. I therefore devoted much attention to means of preventing or limiting side slips without resort to studded tires, especially as I found that these tires were themselves the cause of accidents on very hard and smooth road surfaces (e.g., the side-slip accident by which Mr. Hoare was killed).

I noticed, as everyone has, that the ordinary round section tires were particularly liable to permit unrestricted side slip on any greasy surfaced road or street; that cross grooves and other forms of tread surface afforded no prevention or limitation to side slip, and that loss of tread surface by cutting away of the rubber to form the cross grooves and forms of roughness lessened the life of tires.

I therefore had some tires made with a rectangular tread. I also used the tires which had plain circumferential grooves having outside edges of, approximately, right-angle section.

To test the possibility of safe running, I fitted my own car, which weighed 1 ton 4 cwt. empty, with tires of these kinds, and kept careful record of the running for 40,000 miles. During all that time I never used a studded tire. Of the 40,000 miles, about 12,000 were in and about London, and the remainder all over England with full passenger load and luggage.

The value of the square-edged section of tire lies in the fact that the rubber at the salient exterior edges is free to relieve itself of the load on the wheel by the amount allowed by the rubber flexibility, while the central and greater part of the tread surface is under the pressure of the whole load, and is the more severely punished and worn away. Hence by escaping from all load except that which is necessary to overcome the resistance of the corner of rubber to flexure, or to bend on itself to escape load, the corners are

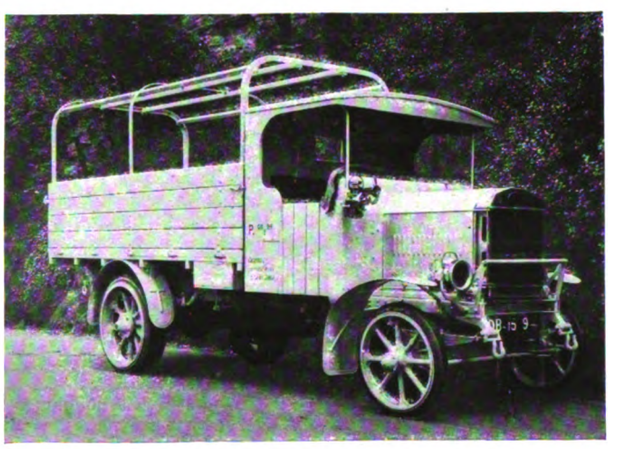

Fig. 3.—Dennis Hinged Sided Wagon with Detachable Roof Frame.

relatively less worn, and they remain comparatively sharp, so as to act as squeegees. On the commencement of a side slip they act as squeegees, and by scraping off the slimy or greasy surface of the road the tread reaches the true road surface; side slip is thus prevented or quickly limited to very small range. This was the lesson taught by my 40,000 miles run without studs, and it is possible to improve upon the angular edged tire which I had made and used.

Willesden Council Works Committee have reported that comparative estimates have been prepared showing the working costs of a motor car for the roads superintendent suitable for the conveyance of small quantities of materials and workmen, and they recommended that a two-seater Bean car with dickey seat should be purchased from Messrs. A. Harper, Bean and Company, Limited, at an approximate cost of £425. They also recommend the purchase of a 6-ton petrol motor roller at an estimated cost of £650.

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AN OMNIBUS WAR SERVICE RECORD.

On the side of omnibus No. B43 of the London General Omnibus Company will be noticed a brass plate, measuring about 12 in. by 8 in., on which is inscribed the words—

1914 Antwerp	1917 Somme
1915 Ypres	1918 Amiens
1916 Ancre	1919 Home

"Lest We Forget."

This plate has been fixed on B43 as a permanent memorial of the magnificent work performed by a number of L.G.O.C. omnibuses in France and other parts of the war zone. Altogether 1,319 omnibuses went on war service, and of this number over 300 have now been returned for service on the streets. B43 was chosen as being the oldest of the L.G.O. veterans, and has been aptly described as the "Old Bill" of the fleet.

Many of these omnibuses are readily distinguishable from the red "General" fleet, being painted green, with the words "Traffic Emergency 'Bus" on the body panel. In addition to the omnibuses which went overseas for service, 1,223 were held in reserve in this country for emergency transport; 223 were engaged in London defence work, and 52 engaged in special air raid service.

Of the staff of the L.G.O.C., a total number of 10,036 men joined the colours, of which 809 made the supreme sacrifice. The number still with the forces is 1,733.

THE GREEN OMNIBUS.

Reminiscences of "Old Bill" of the Transport Service.

I am very proud of myself, for am I not the first omnibus in London to get an official war service badge in recognition of my services in France? In other words, I am the "Old Bill" of the transport services. Others may follow, but I am the very first to get a little badge showing what I have done for "King and Country." I cannot say that it brings a blush to my sides, because my original colour, which lends itself to such blandishment, was changed on a memorable day when I shed my coat of red for one of the present "Distinguished Service" green.

I am told that mine has been a useful career. In my infancy, though, I was a "B" trouble to my sponsors, but with the constant exercise of parental control, and a lavish use of the spanner, I came eventually to the age of discretion, and brought honour upon those who begot me.

My first recollections of active life were when I was sent out each morning with a nurse—by the humans who controlled me he was called a driver—and given a number. Our business in life was to "pick up" humans from all sorts of odd corners, and take them as speedily and comfortably as possible to other out-of-the-way places.

It was a regular sort of job, and I did not mind, though sometimes I did strike, and if my nurse could do nothing with me, I would lay by the roadside until a brother 'bus came to my assistance and gave me a pull home to bed. This life was a very homely one. I made many friends and was well known, and had looked forward to a comfortable hoary old age, until such time when I should go to a place where roads would cease from troubling and some few parts of me might go to the making of a new and great generation of my kind.

My dream of a continued homely existence was rudely shattered. In the early part of August, 1914, there was a great hubbub in the streets through which I ran, and one night after I had gone home to bed a crowd of parents and nurses came and critically examined all my parts. They considered me a healthy child, and proceeded to fill me up with a double quantity of food and drink necessary to keep me in a state of vitality.

There was no sleep for me that night, for soon after this mysterious visit I was taken from the garage that had been my home and started on the most adventurous ride of my life.

Up hill and down dale I went, through little sleeping villages and country lanes, until I came to a great port and had my first view of the sea. Here I was allowed to rest for a while, but not for long, for shortly afterwards my dignity suffered a great shock owing to the fact that I was suddenly gripped by four great claws and lifted off my wheels into mid-air.

The next thing I remember was that with a number of my kinsfolk I was tightly packed and lashed on to the deck of a ship and taken out to sea. Many hours afterwards, when I had become used to a strange motion, never before experienced, I was landed at a place called Zeebrugge, where I was unshipped and surrounded by a group of human beings the like of which I had never before seen. Here I listened for a time to a babel of strange tongues, the only word recognisable to me being "Antwerp," which I had heard my nurse explaining to a number of his colleagues was the place whither we were bound. Just before starting for Antwerp I was agreeably surprised to hear familiar voices (obviously those of Londoners) mingling with the strange tongues, commenting upon my decorations, which took the form of advertisement plates and route boards, which still adorned my sides. They welcomed me as an old friend, and were explaining to all and sundry the meaning of these signs with which I was adorned.

I started off again in the weird half-light of an early dawn, and presently became aware of the noise of vast explosions. Used as I had been to noises, this was really frightening, but with the coaxing of my nurse and skilful pilotage which saved us from falling into great holes in the road, we arrived at our destination. I had been carrying a goodly number of my human friends, but here they left me to undertake the duties for which they were intended.

Later I was sent back, and after a very perilous journey, during which my windows were smashed and my covering very much mutilated, I reached a place called Brussels, where I was given a much needed rest, and had the services of a doctor to set one or two small fractures which I had sustained. I next went to a hospital situated at an old gas works close by Paris, and here I lost my gay exterior altogether. My windows were boarded up, green was substituted for my then healthy red colour, and I was so garbed as to be less liable to any attentions which might be paid to me by the enemy.

During the rest of my career in France I feel legitimately that I was one of the prime factors in winning the war. I carried my friends up and down to the lines; took them their food, and in emergencies saved the situation by taking along their ammunition. I met many comrades, and have made many friends from far lands, and have learnt all about Calgary, Regina, and Winnipeg in the great Ypres advance, and towards the latter end, when I lived a hectic life with the Americans, concluded that if ever I get to New York I shall be able to run a street car service without much help.

And now I am back in my dear old native London—somewhat battered it is true, but still at the service of my old friends, and a moving monument to all who read of the services I rendered to my country and friends in the great upheaval of nations. Do not be too hard on me for my faults, and remember that those of my companions who did not go with me to France performed very useful service at home here in helping to keep the flag aloft.

MOTOR INDUSTRY RESEARCH.

A Research Association of British Motor and Allied Manufacturers has been formed as the result of negotiations between the Government Department of Scientific and Industrial Research and the Association of British Motor and Allied Manufacturers. The Council of the Research Association has been constituted as follows—Mr. H. C. B. Underdown, Commercial Cars (chairman); Dr. T. Blackwood Murray, Albion Motor Car Company; Lt.-Colonel J. A. Cole, Humber; Mr. A. E. Berriman, Daimler Company; Mr. R. Clayton, Clayton and Company, Huddersfield; Mr. A. Craig, Maudslay Motors; Mr. W. Letts, C.B.E., Crossley Motors; Mr. R. Maudslay, Standard Motor Car Company; Mr. A. McCormack, Wolseley Motors; Mr. J. W. Mills, Halley's Industrial Motors; Mr. T. C. Pullinger, Arrol-Johnston; Mr. S. Straker, Straker-Squire; Mr. T. Thornycroft, John I. Thornycroft and Company; and Mr. L. Walton, Vauxhall Motors. The members may be added to.

The Council will approve of the programme of work to be undertaken by the Research Association, and will allocate the funds necessary. The programme will be prepared by a committee of research which will be formed by the Council, and will consist solely of highly qualified scientific and technical men. This committee of research will exercise general control over the leading technical officials of the association, who will be responsible for the conduct of the work in detail. Close co-operation with the Institution of Automobile Engineers will be maintained.

The activities of the Association will fall under two main headings, the collection and dissemination of scientific information of value to the industry, and actual research and experiment. It is not intended at first to establish laboratories, but rather to utilise existing institutions. Adequate funds are assured by subscriptions guaranteed for a period of five years, and substantially supplemented by the Government grant.

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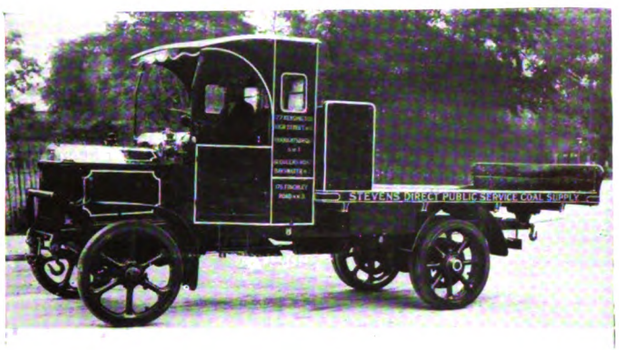
MOTOR TRAFFIC

NAPIER FOR COAL DELIVERY.

The suitability of the Napier chassis for industrial work is shown by the appended photograph of a 2-ton vehicle supplied to the Stevens Direct Public Service Coal Supply. It is interesting to find a firm who have arrived at the right idea for reducing the price of coal to the consumer. The policy of the Stevens Company is to purchase direct from the pithead, whence it is despatched on their



Retail Coal Delivery by Napier.

own trucks to the consumers. By the large quantities ordered, and the use of their own trucks, the company can reduce the cost of freight, and by the use of efficient lorries for delivering to the public, the service can always be relied upon. Messrs. Stevens decided upon Napiers after several trials, and in its new position of assisting to get a satisfactory settlement of one of the coal troubles, it is giving satisfaction.

THE SCOTTISH MOTOR SHOW.

The Scottish motor show in Kelvin Hall, Glasgow, opens on January 23, and it promises to be an exhibition of much interest. The Daimler Company are exhibiting in both the car and commercial vehicle sections. In the car section three cars will be shown—a Daimler "special," a "standard thirty," and a Daimler "light thirty," these three cars representing the Daimler Company's 1920 range of types. The Daimler "special" is identical, in so far as the equipment is concerned, with the cars of this type which attracted such admiration at the Paris and Olympia Exhibitions. The difference is in the colour scheme—they were painted in the Daimler Grey scheme—the Glasgow exhibit is finished in a lake colour scheme as laid out by the Daimler coach work advisers. The Daimler "standard thirty" chassis is fitted with a Cole coupé cabriolet, and a Daimler "light thirty" chassis with a four-seated open body designed and built by Wm. Arnold, of Manchester; a special feature of this Arnold body is the concealed hood with which it is fitted. In the commercial vehicle section a 2-ton Daimler lorry chassis is being shown, fitted with an all-steel and tipping body, operated by hydraulic tipping gear. This chassis is a C.J. type (11 ft. 6 in. wheel base), with a 4-cylinder Daimler sleeve valve engine which develops 30 H.P. at 1,000 revolutions per minute. The body is all steel, with a capacity of 120 cubic feet. A handle placed near the driver controls the oil supply, allowing the body to be lifted, lowered, or held in any position without the driver having to leave his seat. A second handle puts the pump drive in action.

A LEYLAND SCHOOL.—The Leyland Motor Company are arranging with Lancashire County Council for the establishment of a day continuation school for their employees. The firm have promised an army hut for the school, it being at the moment quite impossible to get other premises. At present 170 boys will be dealt with, but there is likely to be more in the near future.

A WOLVERHAMPTON INVESTIGATION.—The Highways Committee of Wolverhampton Corporation report that owing to the high cost of horses, they are of the opinion that steps should be taken to introduce some form of motor traction. A trial is to be made with an electric vehicle, when comparisons will be made, and if favourable a change to this type of vehicle will be recommended in due course.

MOTOR VEHICLES FOR MUNICIPALITIES.

BATLEY TOWN COUNCIL have decided to purchase a motor road sweeping machine at £577.

PRESTON CORPORATION are seeking power to borrow £1,290 for the purchase of a Leyland lorry.

WALSALL TRAMWAYS COMMITTEE propose to spend £15,000 in the purchase of motor omnibuses.

EXETER COUNCIL propose to seek powers to raise a loan of £7,154 for the purchase of electric vehicles.

NEWPORT (MON.) CORPORATION have prepared a scheme for the collection of refuse by motor lorries.

ROTHERHAM CORPORATION are asking for powers to borrow £2,600 for the purchase of petrol lorries and roller.

THE METROPOLITAN ASYLUMS BOARD propose to purchase an Austin motor tractor for the Leavesden Hospital.

LOUGHBOROUGH COUNCIL have decided to seek powers to borrow £1,663 for the purchase of steam wagons and trailers.

ITCHEN URBAN COUNCIL have decided to purchase a 45-H.P. motor fire engine with escape and first-aid equipment.

ROTHERHAM CORPORATION are asking permission to borrow £2,636 for the purchase of four petrol lorries and one petrol roller.

STRETFORD URBAN COUNCIL have asked the Health Sub-committee to consider the question of the purchase of a large motor wagon for the collection of house refuse.

BURTON-ON-TRENT CORPORATION have authorised the surveyor to purchase a mechanical sweeper and loader and a movable water tank to be used in connection with the motor lorry.

CARDIFF CORPORATION have decided to purchase two steam tractors, three 5-ton trailers with tipping bodies, a steam wagon, a petrol wagon, and a petrol road sweeping machine.

THE MINISTRY OF HEALTH have held an inquiry at Hetton in regard to the local Council's proposal to borrow £6,000 for the purchase of electric vehicles for the removal of house refuse.

HULL WATER AND GAS COMMITTEE have authorised their engineer to purchase a motor vehicle for haulage purposes. The Health Committee propose to buy a chassis for use as a disinfecting van.

HULL WORKS COMMITTEE have adopted a report of the City Engineer recommending the purchase of two 6-ton steam wagons and trailers and five 3½-ton vehicles of a type to be subsequently decided upon.

BATH CORPORATION have appointed the chairman of the Surveying Committee and Alderman Long to visit such places as they consider desirable to inspect electric or other mechanical vehicles engaged on work of a municipal character.

GLASGOW WATER COMMITTEE having considered the question of purchasing a 5-ton steam tipping lorry, have authorised the chairman and engineer to order the lorry required, and also to purchase for immediate use a 3-ton petrol vehicle.

ILFORD HEALTH COMMITTEE have been authorised to purchase three motor vehicles for hospital work. The committee had informed the Urban Council that they had been unable to find anything suitable for purchase at a reasonable figure.

HALIFAX CORPORATION have placed an order with the Lacre Motor Car Company for a motor sweeper at £578. The Cleansing Committee have recommended the placing of an order with the Yorkshire Commercial Motor Company for a motor gulley cleaner at £1,386.

HULL TRAMWAYS COMMITTEE have asked the manager to submit prices of a motor delivery van. The manager had reported that difficulty had been experienced in the distribution of stores, ticket boxes, etc., to the depots, and the delay in the collection of cash, and suggested that a motor van should be provided.

COST OF REPAIRING GOVERNMENT LORRIES.—The Heston and Isleworth District Council purchased two petrol lorries from the War Department at a cost of £450 each, it being understood that the cost of repairs would be from £200 to £300. The Council now report that the cost of repairs and the new tires has amounted to £543.

ELECTRICS FOR ILFORD.—At the Works Committee of the Ilford U.D.C. the surveyor presented a report and submitted tenders received from Messrs. Ransomes, Sims and Jefferies, Limited, and the Edison Accumulators, Limited, for the supply of electrically-driven motor vehicles for use in connection with the collection and disposal of house refuse. The committee recommends that the tender of Messrs. Ransomes, Sims and Jefferies, Limited, for the supply of six Orwell electric motors at an inclusive sum of £1,325 for each vehicle (including tipping gear and extras) be accepted.

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MOTOR TRAFFIC

MOTOR TRAFFIC NOTES.

No Lady Conductors.—Bournemouth Licensing Committee have refused to grant motor conductors' licences to five ladies who applied for them.

Omnibus Settlement at Brighton.—The Brighton Corporation have agreed to the terms on which the Corporation omnibus powers are to be leased for a period of seven years to Messrs. Tilling, Limited.

Refusing a Licence.—Worthing Corporation Licensing Committee have refused to grant a licence to a resident for a stage coach in respect of a Ford car proposed to be used for conveying passengers to the golf links.

Compensation for Road Damage.—Morecambe Corporation are again asking local authorities to urge for legislation providing for the payment of a fair mileage rate to road authorities by private motor omnibus proprietors.

Petrol in Bulk.—Bath Corporation have arranged for the Shell Marketing Company, Limited, to supply petrol to the Fire Brigade at 5d. a gallon less than the price charged to ordinary purchasers, subject to its being purchased in bulk.

A Municipal Garage.—Sydney (N.S.W.) Municipal Council have decided to adopt a proposal by the superintendent of the Council's motor garage that certain available spaces in the garage be used for the garaging of private petrol cars, and to make provision for supplying such service.

Delay in Road Material Delivery.—Norfolk County Surveyor reports that road work is still impeded owing to the non-delivery of materials owing to the shortage of railway trucks. Representations on the subject have been made to the Ministry of Transport, but up to the present without success.

A New Service at Sheffield.—The Tramways Committee have decided to start an omnibus service between Midland Station and Brocco Bank. The tramways department recently opened a service between Forth Park terminus and Chapeltown, and they propose to seek powers to run a service to Worksop.

Control of Omnibus Routes.—Ilford Urban Council have received a letter from the Ministry of Transport having reference to the omnibus service in Ilford Lane, stating that the running of this service is a matter which does not appear to be one in which the Ministry of Transport is in a position to intervene.

Trees Dangerous to Traffic.—The Highways Committee of the Lewisham Borough Council report the receipt of a letter from the London General Omnibus Company drawing attention to three trees in Perry Hill, Catford, which they suggest might cause injury to passengers using omnibuses. The committee have accordingly instructed the surveyor to have the trees removed.

U.S.A. Motor Industry.—In the United States there are 222 manufacturers of commercial motor vehicles, producing over 500 models between them. Of these 489 are petrol, 19 electric, and one steam. This year it is estimated that 300,000 commercial vehicles will be built. The number of automobiles of all descriptions registered since 1914 has risen from 1,700,000 to 6,146,000.

Advertisements on Roads.—At East Ham General Purposes Committee, Captain Abercromby submitted a scheme patented by him for printing on roads, by means of a machine, advertisements, notices, etc., his proposal providing for a percentage of the proceeds from such advertisements to the local authority. The committee recommended the Corporation not to agree to the scheme.

Road Traction Amalgamation.—Allied Road Transports, Limited, has been formed to acquire all or any of the shares of the Birmingham and Midland Counties Transport Company, Limited, the London and Midland Transport Company, Limited, and the Liverpool Road Traction Company, Limited. The directors predict that there will be sufficient income to pay the preference dividend six times over.

Main Road Congestion in Lancashire.—In view of the congested condition of the main roads owing to the increasing motor traffic, between Liverpool and the manufacturing towns of south-east Lancashire, the Ashton Urban Council have communicated with St. Helens and Haydock in order to ascertain if they will co-operate to divert the traffic to less populated districts, and promote a scheme for making new roads, etc.

Reading Omnibus Service.—Reading Corporation Tramways Department have inaugurated a motor omnibus service between Caversham Heights and Tilehurst. The chassis have been supplied by the Associated Equipment Company, Limited. The engines are Tylor's 40-45 h.p. The bodies have been built at the tramways depot. The inside seating is composed of spring seats, covered with ratton. The seating capacity is 22 inside and 22 outside.

Fuel Under the Profiteering Act.—Replying to a question in the House of Commons, Mr. Bridgman said:—The average retail selling price of petrol per gallon in tins in November, 1918, was 4s.; the corresponding price in May, 1919, was 3s. 0½d.; and the current average retail price is understood to be 2s. 11½d. per gallon. Petrol has already been declared to be "an article in common use" under the Profiteering Act, and the provisions of that Act apply to it.

Municipal Garage at Ipswich.—According to the annual report of Ipswich Electricity Department, the working of the municipal garage for electric vehicles in 1918-19 produced a sum of £380 for charging batteries. Housing is regularly given to 13 vehicles, and at times there are others. As the space will be required for the rebuilding of the tramway cars, the engineer advocates that some other means of housing the battery vehicles should be provided.

The Management of Harper Bean, Limited.—The directors of this new amalgamation for motor vehicle production have secured the services of Mr. T. Conroy, formerly superintendent of equipment and tools with the Willys-Overland Company. Mr. Conroy has held with the Willys-Overland Company the positions of superintendent, works manager, and general superintendent. During the war he had charge of production in connection with all war contracts undertaken by the company.

Rural Services from Rotherham.—The Corporation Tramways Committee were recently asked by Greasborough Urban Council to instal a 40 minutes' omnibus service instead of the hourly service. The Council also asked for more than a Saturday and Monday service when vehicles are available. The tramways manager informed the committee that a 40 minutes' service was already in operation. The committee propose that the chairman, vice-chairman, and tramways manager should deal with the question of overcrowding and the running of additional omnibuses.

Light Railways or Motor Lorries.—Reporting to Essex County Council upon the recent inquiry into the Ongar and Shenfield light railway scheme, the Clerk states that a conversation took place upon the possibility of developing that district by a motor lorry service, but it was pointed out that the roads affected would be chiefly district roads. It was doubtful whether the County Council would be willing to maintain the roads and bring them up to first-class standard, but if they were asked to do so they would no doubt require a substantial financial grant from Government funds

No Saving by Central Garage.—Recently the Sheffield Corporation asked the Tramways and Motors Committee to consider the question of establishing and maintaining a central garage from which motor cars required from time to time for official use of the various committees and departments could be supplied. The committee made inquiries as to the requirements of the several departments, and have also sought information from other towns where the experiment has been tried, and they are unable to recommend a central garage, being convinced that no saving would be effected.

Unsuitable London Omnibus Routes.—Lewisham Highways Committee have considered the reference to report as to the suitability of Sangley Road, Catford, for omnibus traffic. The road is 40 ft. wide, and the houses are set back a very short distance from the path. The roadway has been partly tar-carpeted and the remainder tar-painted, and owing to the narrowness of the road the borough surveyor is of opinion that there would be considerable vibration, even if the same was wood paved. The committee have requested the omnibus company to alter the routes of omnibuses, using Sangley, Sandhurst, and Torridon Roads, to Brownhill Road.

ROADS ADVISORY COMMITTEE.

Sir Eric Geddes has appointed the following as members of the Roads Advisory Committee—

Mr. F. Dent (County Councils Associations).
Sir Kenneth J. Mackenzie, Bt. (Association of County Councils in Scotland).
Mr. J. A. Brodie, M.Inst.C.E., M.I.Mech.E. (Association of Municipal Corporations).
Major W. H. Prescott, M.P. (Urban District Councils Association).
Mr. P. J. O'Neill, J.P. (Irish County Councils General Council).
The Hon. Sir Arthur Stanley, G.B.E., C.B. (Royal Automobile Club).
Sir William Joynson-Hicks, Bt., M.P. (Automobile Association and Motor Union).
Mr. D. P. Maclagan (Royal Scottish Automobile Club).
Mr. E. White (Royal Irish Automobile Club).
Colonel F. S. W. Cornwallis, D.L. (Royal Agricultural Society).
Mr. Will Thorne, M.P.

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THE Tramway & Railway World
WITH MOTOR TRAFFIC SECTION

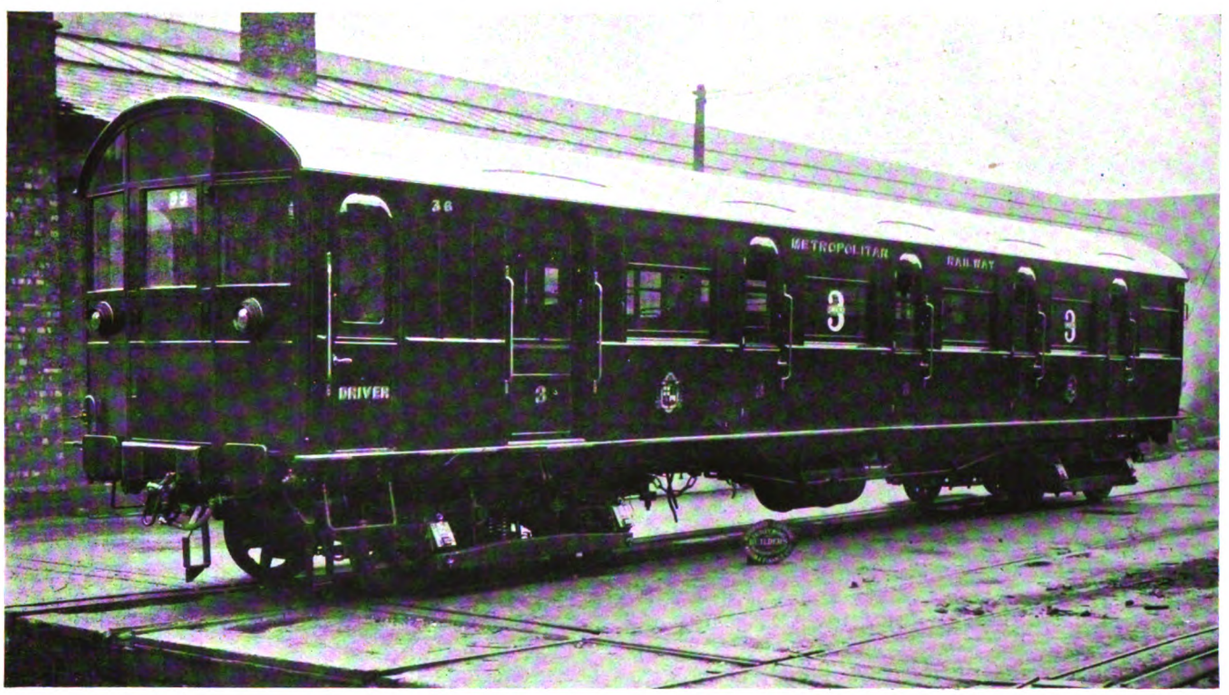
Founded 1892. LONDON, FEBRUARY 12, 1920. VOL. XLVII.

NEW TYPES OF CARS ON THE METROPOLITAN AND DISTRICT RAILWAYS.

SIDE DOORS FOR RAPID MOVEMENT OF PASSENGERS.

For some time complaints about overcrowding on the underground and suburban railways of London have been specially emphatic. Statistics show that for the past two or three years there has been an enormous increase in the number of passengers using these railways, and the increase still goes on. The efforts of the companies concerned to deal expeditiously with the traffic have, of course, been hindered by the difficulties arising out of the war. New rolling stock could not be obtained, and maintenance of existing stock could only be partially and imperfectly carried on. In addition to placing orders for new cars, the companies have been turning their attention to methods of reducing the period of stoppages at stations, because in both these ways more passengers can be carried. The experiment in the latter method lately undertaken at Victoria and Charing Cross Stations on the Metropolitan District Railway have proved useful, and the new cars on order will be capable of rapid loading and unloading. The Metropolitan Railway Company have succeeded in getting an earlier beginning of delivery of new rolling stock than the District Railway Company, and out of 100 cars on order for their electric lines the first trains have been delivered, and are now in service, and others will follow at frequent intervals.

The Metropolitan Railway Company, in their investigation of the subject, came to the conclusion that passengers would leave and enter the cars more quickly if the latter were provided with numerous doors instead of having only one door at each end and one in the centre. The feature accordingly of the new cars, forming the first lot of the 100 ordered from the Metropolitan Carriage, Wagon, and Finance Company, is the provision of five swing doors on each side of the cars in place of the two or three sliding doors hitherto prevailing on electric stock, with a corresponding improvement in entraining and detraining facilities.



Exterior of New Third Class Car with Doors for Use of Passengers—Metropolitan Railway.

The underframes and trucks of the cars are identical with the original ones. As seen from the diagram, the seating has been rearranged, the number of seats being increased and an improved type of seat introduced, the new trains giving a total accommodation of 292 seats against the 268 seats hitherto.

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The new door and seating arrangements allow of improved circulation inside the cars, the great inconvenience occasioned with previous designs to seated passengers by others entering and leaving is now eliminated, all gangways being entirely unimpeded, whilst attention has also been paid to the improvement of heating and lighting, and the provision of ventilation without draughts. A graceful dome roof has been provided, and a "softening" of the lights obtained by the use of frosted bulbs and opal reflectors, and the new system of switching enables the guard to control the lighting throughout the train, thus saving delays now inevitable due to independent car light switching.

A great point achieved in the new train is the elimination of straphanging. "Steadying" rails are arranged to provide a hold for passengers, so that whilst some standing is inevitable during rush hours, passengers will be in a normal position, and not have to stretch their arms above their heads.

The side doors adopted are of the Company's standard type as fitted to compartment stock, but by means of spring buffers and strengthening of longitudinal framing, door controlling straps have been eliminated, as also have window straps on third class. A new form of lock has been fitted which, whilst being very easily operated, is provided with a special safety catch, thus providing an additional safeguard.

To add to the facilities for quick entraining and detraining on the motor cars, arrangements have been made to allow passengers to use the luggage compartment doors. The actual luggage compartments are enclosed by Bostwick sliding lattice gates.

Although the end door has been dispensed with, special handles have been provided to enable guards to pass from one car to another in cases of emergency, whilst stepirons have also been provided for safely alighting on the track when necessary.

Various improvements have also been made to safeguard the safety and convenience of the travelling public by the provision of an improved device for controlling the "trip" for actuating the brakes in emergency, and automatic window "wipers" to enable the driver always to maintain a clear view. The improved buffing and draw gear should give smoother starting and stopping of the train. Route indicators of an improved type have also been embodied.

Whilst everything has been done to promote the comfort of the passenger, that of the staff has not been overlooked, and comfortable, well-upholstered seats for them have been provided.

Interior of Third Class Car with New Arrangement of Seats and "Steadying Rails"—Metropolitan District Railway.

The train has been constructed at the works of the Metropolitan Carriage, Wagon, and Finance Company, at Saltley, Birmingham, and in view of the urgent need for rolling stock to relieve the pressure and overcrowding on the railway, the firm have completed the work in an exceptionally short time, and are now proceeding quickly with the building of other trains required by the railway company, which they undertake shall follow on for delivery in quick succession. The advent of this train is the first proof of the efforts that are being made by the Metropolitan and other London railways to make up the arrears of accommodation that necessarily fell behind during the war, and the travelling public in London is indebted to the Metro-

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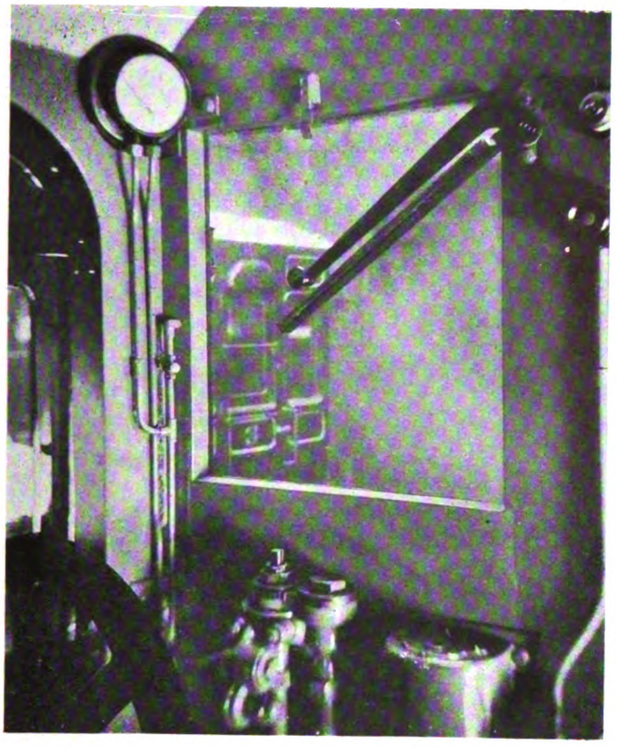
politan Carriage, Wagon and Finance Company for the public-spirited way in which they have taken up the matter in conjunction with and at the request of the railway company, and for the assistance they have rendered and are continuing to render the latter in meeting the requirements of their travellers.



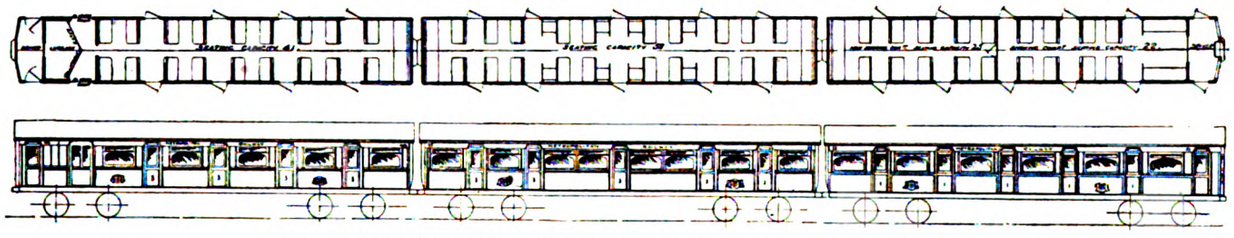
Automatic Window Wiper in Driver's Compartment.

On this page are reproduced the plan and the elevation of the new Metropolitan cars, and also of those of the District Railway. One hundred of the latter were ordered in the first half of last year, and they are to be used in increasing the length of each train to eight cars, equal to 400 feet. This is the maximum length permitted by the station platforms.

In the new District cars, which were described in our issue of July 17 last, the width will be extended to about the limit of the present step-board—and the trailer cars will be fitted with three double sliding doors, each wide enough for two passengers to enter or leave the car at one time. On the motor cars and control trailer cars, in addition to the three double doors, single doors are fitted at the ends, which will be available for the use of passengers when not occupied by the train staff. On an eight-car train the arrangements made give the equivalent of 52 single doors for the use of passengers entering or leaving. These facilities should materially reduce the time taken in loading and unloading, and enable a greater number of trains to pass over the congested sections during rush hours. The present type of end vestibule will be dispensed with in the new design, and the car doors so arranged that they are equally spaced along the side of the coach. Thus, no matter in what part of a car a passenger is seated, he will have a door conveniently accessible.

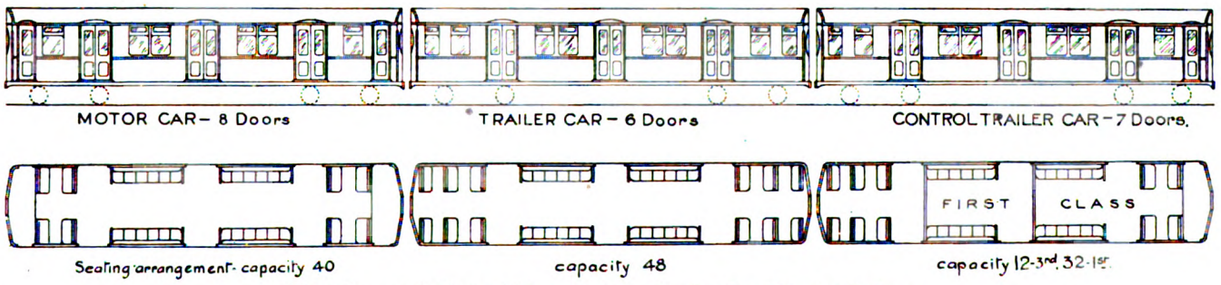
Improved springing will be given to the cars, and they will be fitted with larger bogies and wheels and be higher powered, which will materially improve the running as regards speed and comfort. The dimensions will be 9 ft. 6 in. wide, compared with 8 ft. 6 in.—the present car—and the length 50 ft., against 49 ft. The new trains will be capable of speeds up to 45 miles per hour when working "non-stop" services. The improved acceleration has been brought about by putting additional motors on the trains, and its effect will be to permit of an increased number of trains being passed through the tunnels. Improved braking equipment has been adopted in order to secure more rapid, yet easy, stopping, as the problem of getting more trains through the tunnel sections depends not only upon the time taken between stations, or absorbed by station stops, but upon the period taken in starting and stopping.

The new eight-car set is made up of two self-contained components with a view to operating a five-car train during the slack hours and an eight-car train during the rush hours. The three-car portion can be utilised during slack hours on certain local sections of the line.



Plan and Elevation of New Electric Cars of the Metropolitan Railway.

Special attention has been paid to the design of the seats, and greater gangway room has been afforded in order that the maximum amount of comfort may be obtained by travellers. The upholstery will be in moquette velvet in non-smoking compartments, and in "smokers" of a washable leather or some such material as "pegamoid." At each end of the car



Elevation and Plan of New Cars on Order for District Railway.

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there will be large oval plate-glass windows, which will give a very artistic appearance and finish to the car. The interior metal fittings and door handles will be of a non-oxidising material. Improved ventilation is being fitted which is designed to suit the difficult conditions of a train running both in tunnels and in the open. Convenient handrails and vertical pillars will be provided at points next doorways and at open spaces. The stock is constructed of steel throughout, except for a small amount of woodwork, which is chemically treated in order to make it fireproof.

ELECTRIFICATION OF THE SWEDISH STATE RAILWAYS.

Conversions Accomplished and the Future Programme.

By Georg Brochuer.

In the matter of electric power stations the Swedish State has been to the fore for a number of years, and the Swedish State Railways have for a long time been giving the subject of electrification much attention. The management have investigated the problem from different points of view and studied it in relation to the various issues concerned. The electrification, some years ago, of the Lapland iron ore railway, or rather the western portion as far as Riksgräusen, on the frontier of Norway, has yielded valuable experience, and a comprehensive development of State railway electrification is now about to be inaugurated.

As far back as 1899 a Royal Commission was appointed for the purpose of reporting upon the reserving of adequate water power for the electrification of railways, and three years later a very full report dealing with railway electrification was issued, showing the feasibility of such a step and the advantages it would involve. The matter was followed up, the Riksdag voting the necessary funds for the carrying out of practice experiments on a fairly big scale, during the years 1905–1907. Suitable waterfalls, in addition to the numerous and powerful falls already owned by the State, were also secured.

Energy Transmitted 75 Miles.

The section Kirima–Riksgräusen was selected as the most suitable for the first big venture in the direction of electrification and the large Porjus power station, on the Lule River, was built for the purpose of supplying the necessary energy. The Kirima–Riksgräusen section was opened for full electric working on March 1, 1915, a connecting line between the iron ore company's tunnel station and the iron ore railway station of the State railway's ore station has since been constructed, and has been in use since March 4, 1918. Parliament has since sanctioned the electrification of the eastern section from Kirima to Svartön, on the Bothnian Gulf, and the section Kirima–Nattavara will be first completed.

The electrification of the Lapland railway is carried out with 15 period one-phase current of 15,000 volts for the locomotives. The current, on account of the distance of the Porjus power station to the railway, about 75 miles, is being transmitted at a tension of 80,000 volts. There were, at first, some minor difficulties in connection with the contact lines and the locomotives, but they have all been overcome and the whole electrification system must be said to work most satisfactorily, even when the locomotives are run at the maximum speed of 100 kilometres per hour. The capacity of the locomotives has been materially greater than anticipated and the consumption of current smaller.

Energy from Water Power.—Peat in Reserve.

The first question to be solved in connection with the extension of electrification on the Swedish State railways is whether adequate water power can be obtained. With a view to the solution of this problem the amount of current likely to be required for the year 1925 has been calculated. This calculation is based upon the assumption that the country's railways should receive electric energy from eight power stations, each feeding its own area.. The requisite quantity of current will be found specified in the subjoined table, which also accounts for the quantities of electricity that will be needed for the private railways.

Power Station and Area.	State Railway Requirements in K.W.H.	Other Railways Requirements in K.W.H.
(*a*) Porjus (in Lule River) ...	5,433,000	48,000
(*b*) Urne River	21,496,000	—
(*c*) Indal River	50,398,000	2,564,000
(*d*) Dala River	66,930,000	83,258,000
(*e*) ,, ,, ...	21,122,000	3,456,000
(*f*) Motala River	88,768,000	40,308,000
(*g*) Troelhättan	98,176,000	72,710,000
(*h*) Lagan	60,528,000	61,404,000
	412,851,000	263,748,000

The total is more than 707,000,000 K.W.H. The above table does not include the Kirima–Svartön section, the requirements of which are calculated not to exceed 90,000,000 K.W.H. The load factor may be taken not to be less than 3,000 hours, wherefore the maximum load of the works (average for quarter of an hour) should amount to the figures in the appended table—

(*a*) Lule River	32,000 KW.
(*b*) Urne River	7,200 ,,
(*c*) Indal River	17,700 ,,
(*d*) Dala River	50,100 ,,
(*e*) ,, ,, ...	18,600 ,,
(*f*) Motala River	43,000 ,,
(*g*) Troelhättan	56,900 ,,
(*h*) Lagan	40,600 ,,

The production of these quantities of electric energy will not, according to the investigations, present any difficulties. The electric current required by the State railways, exclusive of that required for the Riksgräusen–Svartön line, does not quite amount to what the Troelhättan power station alone produced in the year 1917.

The requisite quantity of current, however, is likely to increase by 5 per cent. per annum, if the traffic goes on increasing as before. In order to meet this increased requirement for energy it will be necessary to fall back upon the energy contained in the country's peat deposits and it may also be found expedient to transmit power over greater distances to the power station areas in the southern portions of Sweden.

The Order and Rate of Conversion.

The next point to be decided is the order in which the electrification of the different railway sections is to take place. The main object of the electrification is to make the State railways independent of the import of coal from abroad, and it would therefore be natural to start with those sections which consume the largest quantities of coal, but of course it will not do to electrify isolated sections; it must be done in continuous distances of railway.

On this principle it would be correct to continue the electrification from Boden (on the Kirima–Svartön line) in a southern direction, but this section of line consumes but little coal, and it will therefore be

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expedient to make a fresh start in the southern part of the country. The different stages of work might have to be taken in hand in such a manner that it progressed according to the different power stations referred to above. On the other hand, this might, or would, prevent electric working not being completed till several stages of power station construction had been finished.

It is therefore considered most expedient that the electrification be undertaken for the main lines according to the consumption of coal per kilometre railway, and that at the same time the electrification of the secondary lines connected with the aforesaid main lines be proceeded with. First on the list stands, naturally, the railway between the two largest cities in Sweden, through the country from west to east—the Gothenburg–Stockholm railway, with a consumption of 384 tons of coal per kilometre of railway. Next come the Iärna and Katrineholm – Mahnö – Trelleborg, etc.

As regards the rate at which it will here be most advantageous to bring about the transition from steam to electric traction, it is principally a question of financial expediency, inasmuch as there are no technical difficulties in the way of a speedy transfer from the old style to the new.

Price of Coal a Determining Factor.

The conversion first and foremost depends upon the sums available for the purpose, but there is a secondary consideration in connection with the exchange of steam locomotives for electric ones. If the transition takes place rapidly, a number of steam locomotives will become superfluous and have to be discarded whilst yet perfectly fit for service. If the process is retarded too long, it will be necessary in the meantime to go in for more new steam locomotives. A medium course of replacing the steam locomotives by those electrically operated at about the same rate at which the steam locomotives become unfit for service, seems the most advantageous course, and this should probably mean about 30 years before electrification will be completed. According to 1913 prices this would entail an annual expenditure of only 6,500,000 kr.

Exhaustive calculations are available as to the financial aspect of the scheme, but it will hardly be necessary to enter into all those particulars. The financial success of electrification depends more especially on the price of coal. The higher this is, the greater, of course, will be the benefit, but the result will in any case probably prove very satisfactory.

Electrification of Polish Railways.—A Commission has been appointed by the Warsaw Government to gather information on the present position of the Polish railways and on electrically operated systems in other countries. The Commission will then report to what extent it may be desirable to undertake the electrification of the Polish railways.

MANCHESTER STANDARD CAR.

The accompanying photograph shows a car of the design adopted as their standard type by the Manchester Corporation Tramways. The car illustrated has been reconstructed in the department's shops, and has been fitted with vestibules. It will be noticed that there are no platform doors, but the top of the staircase is closed at the driver's end by an arrangement of folding trap doors. New cars of this pattern are now being built in the Hyde Road shops of the Corporation, and have externally the same appearance as the car shown in the illustration. This car provides seats for 78 passengers—32 inside and 46 outside. The weight unloaded is 13 tons 12 cwt. Brill maximum traction trucks and G.E. 200 ventilated motors are fitted.

Manchester Cars Reconstructed and Fitted with Wind-screen.

Mr. J. M. McElroy, the general manager, recently stated that during the past five or six months the department has turned out about thirty bogie cars of this type with covered tops and vestibule ends. By the end of the financial year in March next Mr. McElroy hopes to have completed another 17 cars. An order has also been placed with the English Electric Company for an additional 50 cars, and trucks and electrical equipment have been secured for them. The general manager attributes the difficulty of getting additional bodies to the lack of skilled men in the coachbuilding trade. The department will obtain 50 car bodies in addition to those already ordered. By the combined efforts of the Hyde Road works and of contractors, Mr. McElroy hopes that during the coming year a great deal will be done towards minimising the inconvenience which the public are now suffering.

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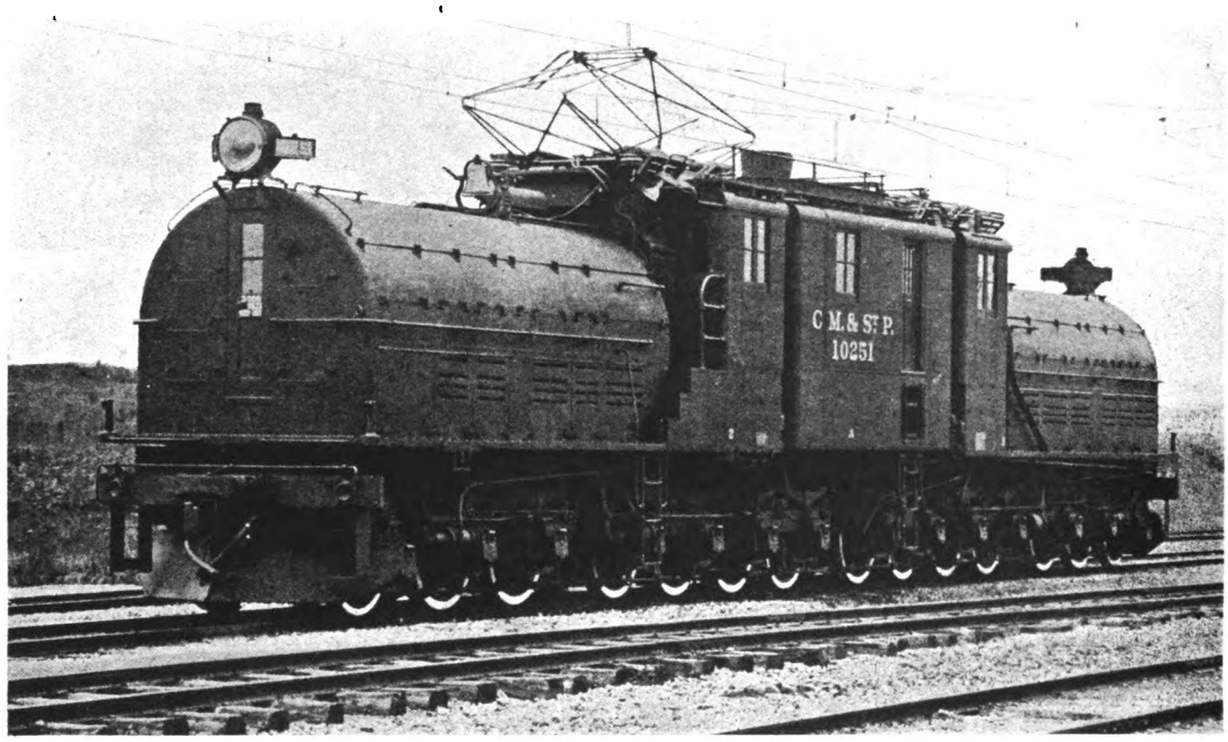
A 3,000-VOLT DIRECT-CURRENT PASSENGER LOCOMOTIVE.

By M. D. Bearce.*

The original electrification of the Chicago, Milwaukee and St. Paul Railway has now been operating for a number of years under the extremely bad weather conditions of the Rocky and Bitter Root Mountains, and as a result of the unqualified success of this Montana electrification the same system will now be used on a section of the line further west to meet the severe grades and snow conditions of the Cascade Range. The motive power equipment of the original electrification consisted of 42 locomotives for freight and passenger service, and four switchers. Of this equipment the freight and passenger locomotives differed from each other only in the gear ratio between the motors and driving axles.

The new 3,000-volt direct-current locomotives, which are now being placed in operation for passenger service on the Othello-Seattle-Tacoma electric zone of the railway, are of an entirely different design. They are built distinctively for passenger service, and possess some very interesting mechanical and electrical features. (The geared passenger locomotives will be employed for freight service with a change of gear ratio.) The new locomotives are of the bi-polar gearless type, with the motor armatures mounted directly on the driving axles. In this fundamental feature they follow the design of the gearless locomotives, which have given remarkable operating results during the past ten years on the New York Terminal of the New York Central Railroad. The chief advantage of this method of construction is the great simplicity of mechanical design which eliminates all gears, armature and suspension bearings, jack-shafts, side-rods, or other transmitting devices. The remarkably low cost of maintenance of the New York Central locomotives over the entire period is attributed largely to the gearless type of construction.

The new Chicago, Milwaukee and St. Paul locomotives weigh 265 tons each, with 220 tons on the drivers. They have fourteen axles, twelve of which are driving, and two guiding axles. The weight of the armatures and wheels is the only dead weight on the track, and this is approximately 9,500 pounds per axle. The total weight on the drivers (458,000 pounds) is 86 per cent. of the weight of the locomotive, but, being distributed among twelve axles, results in a weight of only 38,166 pounds per axle.



New 3,000-Volt Direct-Current Gearless Locomotive for the Chicago, Milwaukee and St. Paul Railway.

One of the most interesting and important features of the locomotive is the design of the leading and trailing trucks and the method of suspending the cab weight upon them. The successive trucks are coupled together in such a way as to dead-beat or break up any lateral oscillations which may be caused by inequalities of the track. The weight of the main cab is so supported on the front and rear trucks that any lateral thrust or kick of the leading or trailing wheel against the track is cushioned by the movement of the main cab, which automatically increases the weight bearing down on the wheels at the point where the thrust occurs and automatically reacts to prevent any distortion of the track. The result of this design is such as to give riding qualities at high speeds which have probably never been attained before in a double-

* Mr. Bearce is on the staff of the Railway and Traction Department of the American General Electric Company, and this article is reprinted from that company's *Review*. Descriptions of earlier types of electric locomotives of the Chicago, Milwaukee and St. Paul have been given in our pages.

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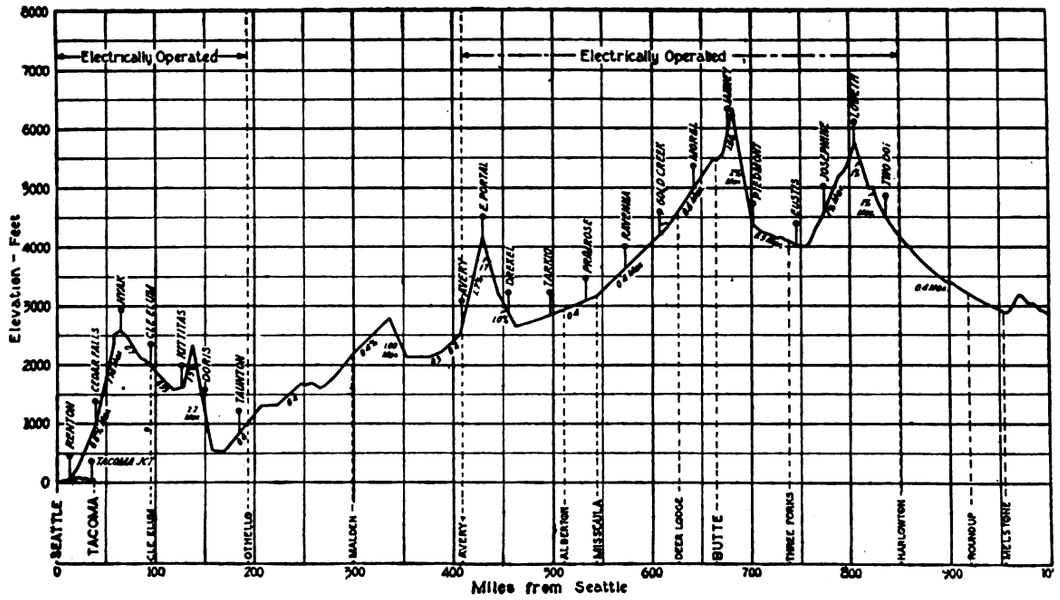
ended locomotive. Exhaustive tests on the General Electric Company's test tracks at Erie, Pa., have demonstrated the remarkable riding qualities of the new locomotive at speeds as high as 65 miles per hour, which is the limit of speed on the length of test track available. These tests also indicate that the locomotive will operate at much higher speeds with equal success.

passenger locomotives, a total of 300 tons. Table I. gives the principal dimensions, weights, and capacity of this new locomotive.

TABLE I.

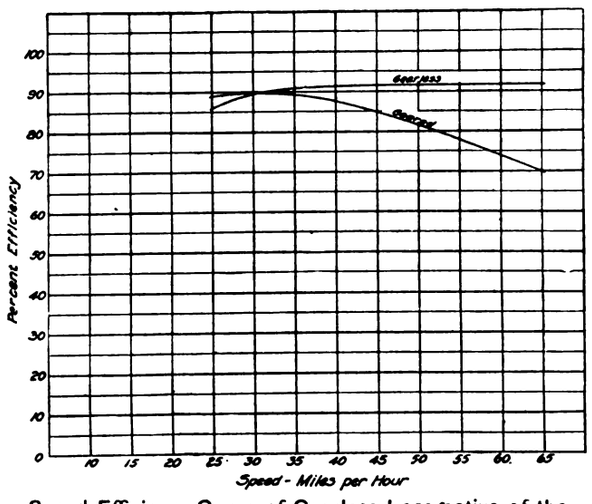
Length inside knuckles	76 ft. 0 in.
Length over cab	68 ft. 0 in.
Total wheel base	67 ft. 0 in.
Rigid wheel base	13 ft. 11 in.



Profile Showing Electrified Sections of the Chicago, Milwaukee and St. Paul Railway, Now Amounting to Nearly One Third of the Distance from Chicago to the Pacific Coast.

The locomotive is designed for handling in normal service a 12-car train weighing 960 tons trailing against a grade of 2 per cent. at 25 miles per hour.

This performance requires 56,500 pounds tractive effort, which is equivalent to a coefficient of adhesion of 12·3 per cent. of the weight upon the driving axles. The wide margin thus provided between the operating tractive coefficient and the slipping point of the wheels,



Speed Efficiency Curve of Gearless Locomotive of the Chicago, Milwaukee and St. Paul Railway.

as well as the ample capacity of the motors, will allow this locomotive to haul trains of as many as fourteen cars in emergencies. For continuous operation, the locomotive is designed to operate at 42,000 pounds tractive effort at a speed of 25 miles per hour.

The total weight supported on the driving axles is practically the same as that on the present geared

Diameter driving wheels	44 in.
Diameter guiding wheels	36 in.
Weight electrical equipment	235,000 lbs.
Weight mechanical equipment	295,000 lbs.
Weight complete locomotive	530,000 lbs.
Weight on drivers	458,000 lbs.
Weight on each guiding axle	36,000 lbs.
Weight on each driving axle	38,166 lbs.
Number of motors	12
One hour rating	3,240 H.P.
Continuous rating	2,760 H.P.
Tractive effort—one hour rating	46,000 lbs.
Tractive effort—continuous rating	42,000 lbs.
Tractive effort—2 per cent. ruling grade with 960-ton train	56,500 lbs.
Co-efficient of adhesion ruling grade	12·3 per cent.
Starting tractive effort—25 per cent. co-efficient of adhesion	115,000 lbs.
Rate of acceleration starting 2 per cent. ruling grade	0·48 m.p.h.p.s.

The control equipment for the new locomotive is similar in most respects to that used on the original locomotives which have now been operating nearly four years. Modifications were, of course, necessary to comply with the different arrangement of motors. Advantage is taken of a new scheme of connections by means of which four of the main locomotive motors are utilised to furnish exciting current during regeneration, thus reducing the size of the motor generator set used for control, accessories, and train lighting. An appreciable reduction in the weight of control equipment is obtained, yet at the same time effective regenerative electric braking is provided on the down grades. The motor-generator set furnishes control current for operating the contactors and for charging an 80-volt storage battery which supplies lights and power for the accessory apparatus. The battery is, in general, similar to those used on the passenger coaches. The master controller is constructed in three sections arranged for both motoring and regenerating, all of the cylinders being suitably interlocked to prevent incorrect manipulation.

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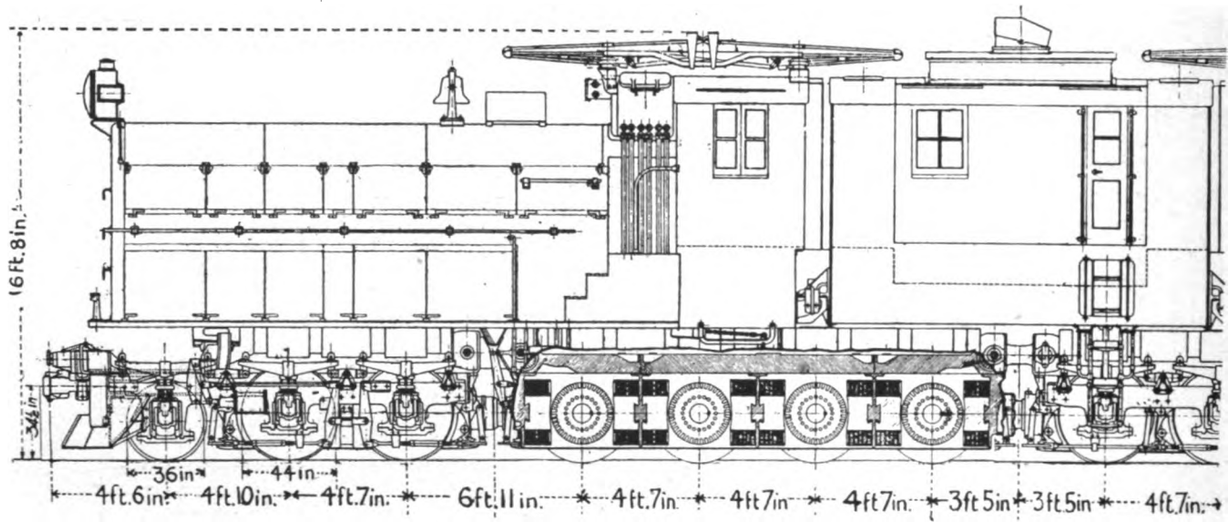
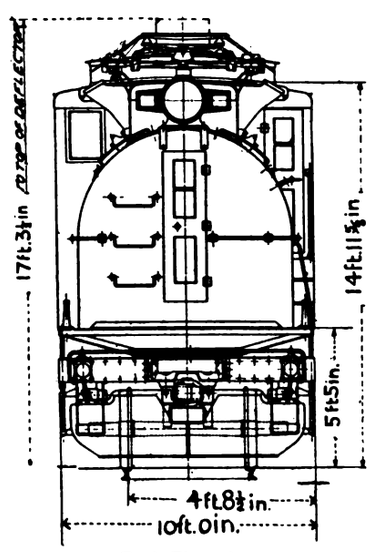
The motors are bi-polar, the two fields being supported upon the truck springs with full freedom for vertical play of the armature between the pole faces. Below is shown the outline of the locomotive with a sectional view of four of the motors indicating the location of the armatures and the magnetic section. For full-speed operation, the twleve motors are connected three in series with 1,000 volts per commutator.



Side Elevation of a Part of 3,000-Volt Direct-Current Gearless Locomotive.

Control connections are also provided for operating four, six, or twelve motors in series. Additional speed variation is obtained by tapping the motor fields in all combinations. Cooling air for each pair of motors is supplied by a small motor-driven blower. This arrangement avoids the heavy duct losses encountered with a single large blower.

The speed curves on the previous page show that the gearless locomotive gives much better efficiency at high speeds than the geared type, owing to the elimination of the gear drive. In passenger service, where there are long stretches of level track and stopping points are comparatively few, a much higher efficiency is obtained in all-day service. These curves show an efficiency at 50 miles per hour approximately 10 per cent. higher than the geared type of locomotive.



End Elevation.

The 3,000-volt contactors and grid resisters are mounted in the curved end cab at each end of the locomotive. In one of these cabs there is also located the 3,000-volt direct-current air compressor and storage battery. In the other is located a small motor-generator set and the high-speed circuit breaker. The operating cabs contain the master controller, indicating instruments, and a small air compressor operated from the battery circuit and having sufficient capacity for raising the pantograph when first putting the locomotive in operation. Near the controller are the usual air brake handles for the standard braking equipment.

The centre cab is occupied by the oil-fired steam boiler for heating the passenger train and by accessories including tanks for oil and water, circulating pumps, and a motor-driven blower for furnishing forced draught. A slider pantograph, similar in construction to those now in use, is mounted on each of the operating cabs. This pantograph has two sliding contacts, giving a total of four points per slider with the double trolley. The pantograph and flexible twin trolley construction enable the locomotives to collect currents as high as 2,000 amperes at speeds up to 60 miles per hour without noticeable arcing at the contact points. The second pantograph is held in reserve as a spare. Sand boxes, with pipes leading to each pair of driving wheels, are located directly beneath the pantograph outside the operating cab.

On the preceding page is given a continuous profile from Seattle to a point about 1,000 miles east, including the Cascade electrification, the Harlowton-Avery electrification, and the intervening 220 miles. The new locomotives will operate between Othello, Seattle, and Tacoma, including 17 miles of 2·2 per cent. grade from the Columbia River west, and 19 miles of 1·7 per cent. grade between Cedar Falls and the summit of the Cascades. The traffic over this division consists of the heavy main line transcontinental passenger trains "Olympian" and "Columbian," carrying from eight to twelve steel passenger coaches, which will be handled over the maximum grades without helpers. Freight pushers are already in operation on the 2·2 per cent. grade, using two of the locomotives from the original electrification. It is expected that electrical operation during the coming winter will assist in overcoming many of the delays which are commonly met during winter operation in this district.

ANGLO-ARGENTINE TRAMWAYS.

INCREASE IN FARES GRANTED BY THE MUNICIPALITY.

The directors of the Anglo-Argentine Tramways Company have announced that the municipality of Buenos Ayres, recognising the justice of the claim to an increase of fares to meet charges that were never contemplated when the concession rate was fixed, have sanctioned a conditional increase from 10 cents. (the fare fixed by the company's concession) to 12 cents. The directors hope that the increase will place the company in a position to meet the pressing demands of labour, the cost of the reduction of the working day to eight hours, and its obligation under the new Pension Law, besides contributing materially towards the extra cost of working, for which the abnormal price of fuel is largely responsible.

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BRITISH FARE SYSTEM INVADES AMERICA.

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AN ACCOUNT OF THE PRINCIPAL DEPARTURES FROM THE UNIT-FARE SYSTEM. HABIT, INCONVENIENT COINAGE SYSTEM, AND THE RETENTION OF THE TIME-LIMIT TRANSFER OFFER UNUSUAL DIFFICULTIES. THE FAILURE OF THE PUBLIC SERVICE RAILWAY AND THE SUCCESS OF OTHERS.

BY WALTER JACKSON.
(Consultant on Electric Railway Fares, Brooklyn, New York.)

The zone or sectional fare is not a novelty in American electric railway practice, inasmuch as multi-fare operation naturally has been in use on our cross-country and interurban railways since their inception. However, such fares were usually in multiples of 5 cents, and the boundaries of each zone were fixed either by mileage posts or by the harassment of the villages which granted the concessions to operate over their thoroughfares. There was little or no attempt to vary the length of the sections in accordance with the customer-catching and revenue-producing principles of the British-made zone fare. The methods of fare collection on such lines varied (and still do vary) as widely as the character of the railways. On lines which were direct extensions of city routes into the adjacent country, the fare to the city limits, regardless of distance, was the 5-cent (2½d.) piece of blessed memory; thereafter the conductor actually made a separate 5-cent. collection for each section! On other lines, the conductors upon passing the city limits would collect full fare to destination—a coloured slip, which the passenger usually stuck in his hat (hence "hat check"), serving to show how far he was entitled to ride; but the conductors still had to go through the car in each section to take up the slips of all riders who were due to depart at the next stop. On some lines the conductor collected full fare to destination and then trusted to his memory to prevent over-riding.

Better methods were and are applied to the high-speed interurban railways. On some of these the conductor sets a pointer dial on a printing register to indicate the fare collected and rung up, while the passenger received a hat check as hereinbefore described. A variant of this multi-fare register not only prints the fare recorded, but also shows between what zone points the ride was taken. This gives a valuable automatic check on the lengths of ride between different stations, in addition to the classification of fares paid.

On other interurbans duplex tickets are used. In this system the conductor issues half of a twin ticket to the passenger and retains the other half as an auditing record. Sometimes the auditing half remains in a locked box to avoid manipulation by dishonest conductors. Both halves of duplex tickets are supposed to be punched or notched exactly alike to show the fare paid and the starting and ending points of the journey. On a number of railways, the conductor is expected to take up the passenger's receipt before he leaves; on others, the passenger throws away or carries off his receipt as do riders in the United Kingdom.

In the earlier days of the interurban, the fares were commonly in multiples of 5 cents. Later, the steam railroad practice of charging by the mile was followed more widely. In this plan, it is customary to begin with a minimum fare of, say, 10 cents. (5d.) and then charge 2, 2.5 or 3 cents a mile for the ride in excess of the minimum. From this practice came the appellation of "copper zone system." Most interurban railways follow steam practice also in the selling of mileage books, but a large part of the sales are either individual trip tickets bought through booking agents or cash paid on the car.

Two early individual cases are worthy of mention, because of their approach to European zone-identification practices. These are the Stark Electric (interurban) Railway of Canton, Ohio, and the New York, Westchester and Boston Railway, which runs out of New York City north through Westchester County. In the Stark plan, first applied in October, 1914, the passengers enter and leave via an end, not a side, door in the rear. As they enter, they deposit their cash, ticket or mileage fare in a fare box, whereupon the conductor gives each a ticket bearing the number of the zone into which the passenger is entitled to ride. On leaving the car, the passenger must give up the ticket to the conductor. Variations of this scheme have since been adopted by several score city and suburban railways.

The plan used since 1912 by the New York, Westchester and Boston Railway (the "Boston" represents a forlorn hope) was necessitated by the condition that it is practically a city-type rapid transit line, the distance between its stations being too short and its cars too long to permit fare collection by the car conductors. The passenger therefore purchases his ticket at a booking office before boarding the train. Upon leaving the train, he drops his ticket in a box at the exit station. Over-riding is checked very readily by the box attendant, because every ticket given up in his zone must be of the same colour, no matter from what other station it was sold. Over-lap tickets, the only exception to this rule, are parti-coloured, one half showing the colour of one zone and the other half the colour of the next zone in the desired direction of travel. Commutation tickets or seasons are punched at the station of entry and visèd by the ticket-box attendant at the station of departure.

FIRST ZONE-FARE SYSTEM OF RADIAL TYPE.

The foregoing account of practices on suburban, cross-country, interurban, and rapid transit lines outlines roughly some varieties of multi-fare collection outside of city service. It remained for the Milwaukee Electric Railway and Light Company to take the first step toward city zone fares by inaugurating its central-area or radial zone system, January 18, 1914. In this company's plan, the unit fare of 5 cents (now 7 cents) was retained within the Milwaukee city limits covering radii of 3·12 to 5·94 miles and a charge of 2 cents per zone mile was established over different routes reaching into the suburbs. Passengers outbound from Milwaukee or riding within that city drop their cash or metal token fare in a locked, non-counting type fare box as they enter the car, receiving no fare receipt but being entitled to a transfer for use within the city limits. The conductor then closes the rear doors and moves the fare box to the front end. Passengers who board an outbound car (*via* front platform) outside the city area pay the base fare as before, but receive a receipt which shows the zone of entrance. As they depart they give up the receipt to the conductor and deposit in the fare box the additional 2, 4, 6 cents, etc., equivalent to the additional zones. Obviously, this prevents over-riding because the departing passenger is under the direct control of the conductor. A passenger without a receipt would have to pay for the full ride from the city to his alighting zone. Passengers inbound to Milwaukee pay full fare to destination. Inasmuch as only a few inbound passengers are intra-zone riders (nearly all going to Milwaukee) no receipts are issued. The conductor simply keeps an eye upon those passengers who have paid only the minimum fare. This plan would hardly work on heavy British lines, but for the sparsely-travelled suburban lines of this railway it is declared satisfactory.

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A somewhat different procedure is followed on the South Milwaukee line which has heavy industrial riding. Passengers outbound from Milwaukee name their destination on boarding the car, drop their fare in the locked box and receive a fare receipt showing their destination. In this case, also, the receipts must be given up to the conductor on leaving the car, thus preventing over-riding. Inbound passengers on this line pay and receive a receipt in the same fashion as outbound riders, except for the fact that the conductor takes up all receipts on reaching the city limits of Milwaukee, on which occasion he also issues any city transfers requested. By this arrangement passengers taken on within the city one-zone limits do not have to secure a receipt for fare paid.

Owing to the fact that the American coinage system is not well adapted to a variety of odd fares, the Milwaukee company introduced the practice of having the conductor go through the car, while in the suburban zones, to make change for the passengers in advance of their paying fare. This plan has been followed to advantage by the Connecticut Company, the zone system of which is described hereinafter. Some idea of the number of fare transactions handled per car-mile is conveyed by the statistics of revenue passengers per car-mile. This figure for the Milwaukee suburban lines has risen from 4·62 in 1913 to 6·20 in 1918.

The system in use on the lines of the Portland, Maine, city and suburban system is so complex that the writer despairs of describing it fully without excessive inroads upon the paper and ink supply of the U.K. The base cash fare is 9 cents, which is good for three zones. Additional zones cost 3 cents each. If an ordinary five-ride coupon ticket is purchased, the fare is 7 cents. Long-distance riders use a 15-coupon ticket, which gives a cost of 2⅓ cents per zone. A three-zone base fare ride may be taken on one car, or one or two of the zones may be a transfer-ticket ride. Indeed, it is the transfer that is responsible for the complexity of this as well as some other American zone fare systems. As for the long suburban rides, the absence of fare receipts leaves too much to the honesty of the passenger and the memory of the conductor. In some cases, the conductor goes through the car several times; in others the passenger pays to the destination stated by himself without being subjected to a tangible check. It should be added that although the despised bell punch is not used, the Portland conductor has a non-counting punch for notching off fare coupons.

Other central area zone systems must be ignored for lack of space—not for lack of variety!

Public Service Railway's Zone System.

We now come to a consideration of the most ambitious project of all—that of the Public Service Railway, whose experiment ran a fevered course from September 14, 1919, with a scale of 3, 5, 7 cents, etc. on a straight mileage basis and no transfers; from November 16, 1919, to December 6, 1919, with a scale giving the first 2 miles for 5 cents and additional miles for 1 cent each, with an additional charge of 1 cent for a transfer; and now back to a fare of 7 cents flat plus 1 cent charge for transfers. The company, in requesting the abolition of the zone system, declared that it had lost $9,000 a day under the first plan and $12,000 a day under the second. The company's own plan, which contemplated a charge of 5 cents for the first mile, 1 cent a mile thereafter and an additional charge of 1 cent for a transfer was not tried at all.

The order that a zone system be submitted came July 10, 1918, from the Board of Public Service Commissioners of New Jersey, the regulating body of that State. Following this order, the railway undertook a comprehensive survey of the 2,100,000 city and country people which it serves with 849 miles of single track. The location of the principal industries, amusement centres, business and shopping districts were plotted in great detail. Many traffic counts were also taken to secure a classification of the then patrons according to distance between boarding and alighting points.

The results of the industrial survey and maps showing the proposed zone-mile limits were printed in an imposing volume dated March, 1919. This publication was unfortunately silent on what had been learned as to the relative proportion of riders of different lengths. However, a clue to the mystery is obtainable by studying the company's estimate of the number of each classification to be expected with a fare of 5 cents for the first mile (4 cents readiness to serve and 1 cent movement) and 1 cent movement charge for each succeeding zone-mile, with a 1 cent "readiness-to-serve" charge for a transfer. Note how these percentages differ from what is customary on British tramways of almost every type—

Numbers and Percentages of Passengers expected by Public Service Railway for Year ended June 30, 1920, according to Length of Ride.

No. of Zone Miles.	No. of Passengers.	Per cent. of Total.	Cumulative Per cent. of Total.
1	45,576,440	14·56	14·56
2	72,772,164	23·26	37·82
3	66,387,564	21·21	59·03
4	38,391,074	12·27	71·30
5	30,809,146	9·84	81·14
6	20,057,164	6·41	87·55
7 to 80 inclusive	38,940,111	12·45	100·0

Evidently the Public Service Railway was not hunting hard for short riders. Indeed, the extraordinary maximum of 80 zones (a ride across the State!) and the low movement charge of 1 cent per mile lead to the assumption that the company was rather concerned to hold on to that much smaller class of long-distance riders which belongs more properly to the steam railroads! It is true that the jitney omnibus had proved a formidable short-haul competitor to the company in offering a 5 cent fare for a 1 to 2 mile ride, as against the company's 7 cent flat rate; but the company seems to have taken the permanent loss of most of these short riders for granted. The importance of removing the jitney omnibus menace may be gauged from the fact that in the city of Newark alone this largely unregulated competitor carried 16,237,719 passengers for the first half of 1919, compared with 17,120,652 passengers in the entire year 1918!

More light on the short-ride question is afforded by a tabulation of the size and character of the chief urban committees within the Public Service system. They are—

Newark ...	350,000	Bayonne ...	55,500
Jersey City ...	268,000	Passaic	54,800
Paterson ...	125,600	West Hoboken ...	35,400
Camden	95,000	Perth Amboy ...	32,000
Elizabeth ...	73,500	Orange	30,000
Hoboken ...	70,000	New Brunswick	23,400
		Total ...	1,213,200

A very large part of this population lives in three to six-family tenement houses, particularly in the communities of Newark, Jersey City, and Hoboken, which are within the New York metropolitan area, although in a different State. There are many reasons why cities like these should show a much higher proportion of short-fare riders than the Public Service Railway ever had or ever expected. The flat fare was one obstacle to the development of such short riding; the

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use of very large cars at long intervals, quite regardless of the needs of the smaller communities, was another reason. As a proof, there is not one lightweight, one-man car on the entire Public Service Railway, although such cars have been found highly suitable on scores and scores of urban and suburban electric railways. In fact, more than 1,300 such cars were ordered in the United States during 1919, constituting about 75 per cent. of *all* the city surface cars ordered!

In presenting its plan, the company said that it had made a first-hand study of the existing zone fare practices in the United States. Foreign zone fare practice was dismissed out-of-hand, although no representative of the company had made a detail study of non-American practices. Even granting that the particular procedure of fare-collection used in Great Britain is not applicable to America because our standing loads have been so high, there was and is a great deal to learn from zone fare practitioners as to the general principles that should be followed in laying out zone boundaries and in attracting the greatest possible revenue through the greatest possible number of short-haul voluntary riders.

As one result, the zones of the Public Service Railway were laid out in zone miles with a tolerance limit of 500 ft. over or under. This proved so small that in a few cases the zone boundary did not coincide with intersecting routes, thereby compelling passengers who wanted to ride all the way to pay another cent for a few hundred feet to the transfer intersection, although they were to pay an extra cent for a transfer anyway. There were other *gaucheries* that could have been avoided by a close study of the experiences of Great Britain, Australia and other zone fare countries. These weaknesses were brought out at a series of hearings before the Board of Public Commissioners in June, 1919, but many had remained uncorrected when the zone fares were inaugurated.

After the hearings the company publicly acknowledged that it was willing to withdraw its own plan in favour of a base fare of 3 cents for the first mile, 2 cents a mile thereafter and no transfers. It stated that this plan promised more revenue than its own or than that of the Commission's experts calling for a base fare of 5 cents to cover two miles. Continuing, T. N. McCarter, president of the company, added that if a flat fare were used it would have to be 9 cents plus a 1 cent charge for transfers. He did not want a 9 cent fare, as that would impair too greatly the usefulness of the company through driving away still more riders. Since this statement, made July 29, 1919, Mr. McCarter has declared his willingness to try to carry on with a 7 cent flat fare and 1 cent transfer, although operating costs in the interim have risen still higher.

Preceding the inauguration of the first zone fare system, Sunday, September 14, 1919, the company conducted an advertising campaign in the newspapers and also enlisted the aid of the moving picture. However, the campaign does not appear to have reached efficiently a large proportion of the non-American population. No publicity could have been too thorough inasmuch as not one or two selected routes, but the entire 849 miles of city, suburban and cross-country lines were to be converted overnight from rear-entrance pay-as-you-enter with flat fares and transfers to a system of front-entrance, pay-as-you-leave with no transfers but with zone identification tickets.

Passengers Resort to Violence and Boycott.

Aside from the admitted deficiencies of the publicity campaign was the fact that the company did not have the time to secure and instal the elaborate mechanism which it felt would be a sure way of getting all the fares. For the time being, it undertook to use makeshift equipment. Thus, the motorman did not issue the zone entrance tickets from a machine but by hand; the zones through which the car passed successively were not shown on synchronously-operated indicators on the front and rear platforms, but on the leaves of calendar type pads, which were often found torn or otherwise mishandled in a way that left the stranger in ignorance of where he was at from a fare-charging standpoint; and lastly, while cash registers (of shopkeeper's type) were used on part of the cars (the original counting type fare boxes remaining on the others), these registers were not set automatically in synchronism with the indicators and the motorman's ticket-issuing machine, as had been planned.

The mode of operation was as follows:—On boarding the vestibuled front platform, the passenger received from the motorman a check bearing the number of the zone of entry. This check the passenger surrendered to the conductor when ready to leave and pay his fare *via* the vestibuled rear platform. Of course, an habitual rider on a given route would know his fare; others were quite dependent upon what the conductor told them. The scale of fares was printed on both the calendar indicators previously mentioned and on the back of the zone entrance slips, but many of the foreign-born riders were too ignorant of English and of figures to understand them.

The essentially weak point was this—that since the passenger had no selfish interest in getting a receipt for the exact fare paid, Mr. Conductor was free to play any hocus-pocus his ingenuity suggested. Through collusion with the motorman, it was possible to use the same entrance receipts a second time. Through the indifference of the passenger, the conductor could put all the fare or a part of it in his pocket without using the fare box or register according to the rules. It was not overhard to register a 7 cent collection as 5 cents, a 9 cent fare as 7 cents, &c. Indeed, one of the "Please-don't-quote-me-as-authority" private statements of a Public Service man was that there was a suspiciously large number of 3 cent fares.

The effect of the Public Service type of zone fare was particularly unhappy with a number of shipworkers, who objected strenuously to being carried several hundred feet past the gates of the shipyards and then to pay their fare as they went through a stockade. They manifested their displeasure by smashing car windows, abusing blameless platform men, and boycotting the railway. It would have been much easier to handle these men on a prepayment basis when they boarded the cars, one, two or three at a time outbound to the yards, than to wait until the entire load wanted to get off at once. A similar condition was presented at the ferry terminals, where passengers who had allowed themselves about 10 seconds to sprint to their usual boat were more than annoyed at having to stand in line for many minutes before the conductor could get their fare and allow them to pass. "Ils ne passenont pas" was also the slogan of these conductors!

One clear lesson from these experiences is that the method of fare collection must depend upon which end of the route gets the "shock" traffic. Where all or most of the passengers on American cars board *en masse*, but leave individually, pay-leave is the better way; but where they board singly and depart *en masse*, pay-enter is better. The practicability of running the same route prepayment in the morning to the industrial centre and postpayment in the evening to the residential districts had been demonstrated for unit fares several years earlier by the Cleveland Railway, but the Public Service Railway did not try it for zone fares.

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As the 3, 5, 7, etc., zone fare adopted by the company was strictly cumulative, with no amelioration for the suburban rider, either in commutation rates or longer zones in the sparsely-settled districts, it was not popular with that class of riders. Many of these people suddenly found themselves forced to pay more than double their usual fare. Wherever they could not take recourse to steam trains or motor omnibuses they "helped to make Rome howl."

The system aroused so much antagonism, resulted in so much boycotting and theft and made life so miserable for the honest platform men, that the company soon asked for permission to restore the flat fare of 7 cents with 1 cent for transfer. The Commissioners, however, urged the company first to try their alternative plan of beginning with a 5 cent fare for the first two miles and charging only 1 cent per zone mile thereafter. Despite the fact that the second plan had the advantage of following a month's experience with zone fares, its use for the period November 16 to December 6, 1919, actually increased the losses another $3,000, or from $9,000 to $12,000 a day. The boycott on the Camden division in itself caused a loss of $4,500 a day. The company estimates that the total loss due to this experiment was $1,500,000! An idea of what proportion this sum bears to the total business of the company may be gleaned from the fact that the company estimates only a total annual passenger revenue of $24,000,000 under the restored fare of 7 cents flat and 1 cent for transfers. The same estimate assumes that this rate will produce $2,500,000 more gross revenue, but $3,100,000 more net revenue because of the return of higher schedule speed, etc. In spite of these figures, the Board of New Jersey Commissioners still feel that the zone fare has not received a fair trial at the hands of the public and the railway. So now the period of "watchful waiting" has come.

Connecticut Co.'s Zone Rates more Successful.

In contrast to the failure of the Public Service Railway is the success of the Connecticut Company, which operates more than 500 miles of single track within the State of Connecticut, tying together a number of cities up to 180,000 population with a network of city and cross-country lines. The inauguration of zone fares on November 2, 1919, was preceded by a study similar to that made by the Public Service Railway. The method of pay-leave fare collection was also the same in principle, except that fare boxes only are used, nor do the zone-entry slips carry a fare schedule. The Connecticut Company also has to deal with motor omnibus competition at lower fares. For all that, this company reports that for the first month (November), its income has increased $128,000, or 17 per cent. In localities without omnibus competition the increase was much greater.

The basic fare, 6 cents, was also the preceding unit fare. This fare is good for two zones, the first zone from the centre of each city having a radius of approximately 1½ miles and the second of 1 mile. Additional zones averaging 0·8 mile cost 2 cents each. There is no charge for transfers. Under this plan, the people living within all or the greater part of the city area pay no more than before. That this plan in comparison to that of the Public Service Company has brought more revenue instead of less may be set down to a number of causes as follows—

First.—Better education of the public.

Second.—A better attitude toward the railway.

Third.—Heartier co-operation from the employees, particularly in the commendable efforts of the conductors to make change for riders *en route* and to stimulate the sale of metal tokens.

Fourth.—Operation of cars on the *prepayment* plan where riders come on singly but leave *en masse*.

Fifth.—Greater elasticity in the length of zones, including neutral areas in the city centres.

The principal source of delay on the Connecticut system is due to the fact that a much smaller number of passengers have exact fare than would be the case if the minimum fare were 5 cents instead of 6 cents. In consequence, the delays at busy intersections are still a disturbing and doubtless costly factor. With the wider introduction of one-man safety-car operation on this railway, operating expenses are being lowered to the point where a 5 cent minimum fare should be feasible. In that event, the present delays will be greatly reduced and the schedule speeds increased to the satisfaction of all concerned.

Zone Fare receiving Intensive Study.

From the foregoing it will be seen that, although the most ambitious project in zone fares has gone down as a failure, other American tramways have been more successful. To-day, the logic of the zone fare is more widely admitted by our operators than in the past. Now, the problem is one of developing devices that can be applied to American prepayment and postpayment cars without overburdening the platform men or slowing down the schedule. As to that, the array of zone-fare machines displayed at the 1919 convention of the American Electric Railway Association augurs well for the ultimate success of the zone fare invasion of America.

A DOUBLE-DECK RAILLESS CAR.

Some time ago Mr. R. H. Wilkinson, general manager of Bradford Corporation Tramways, designed a railless car with an enclosed top deck, and submitted the drawings to the tramways committee. Subsequently application was made to the Ministry of Transport for permission to make use of a vehicle constructed in accordance with the designs, and this has now been granted.

The vehicle, the plan and elevations of which are reproduced on the opposite page, provides seating accommodation for fifty-one passengers. It will be constructed at the Corporation works as soon as possible, and will then be put in service as an experiment. It will be driven by one tramcar motor of standard design mounted on a solid tramway axle. The Ministry of Transport has granted permission to increase the weight of the railless cars from five tons loaded to five tons unloaded. This will allow the cars to be constructed more substantially than hitherto.

EDINBURGH CABLE CARS MAY BE REPLACED BY OMNIBUSES.

Mr. R. Stuart Pilcher, general manager of the Edinburgh Corporation Tramways, has presented an important report to Edinburgh Corporation in which he proposes the scrapping of part of the cable system, and suggests that on the northern routes motor omnibuses should be substituted. He points out that on these routes there is a loss at the rate of £11,619 per annum, and that as they are largely self-centred they can be treated separately from the rest of the system. On the question of electrification, Mr. Pilcher says that much of the rolling stock is unsuited for conversion to electric cars, and that practically the whole of the permanent way would require renewal. Whether these routes, with their limited earning powers of £273 per car-mile of route, will justify the building of new electric lines, will depend upon the future level of prices.

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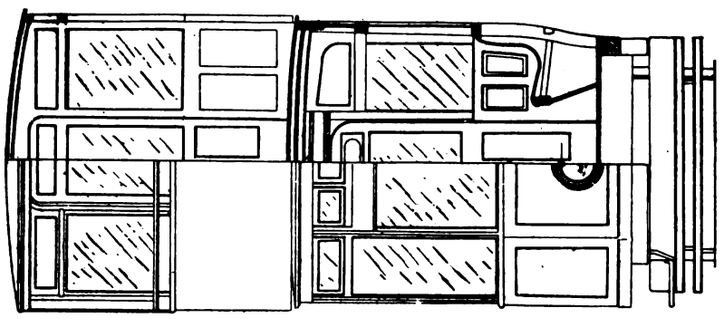
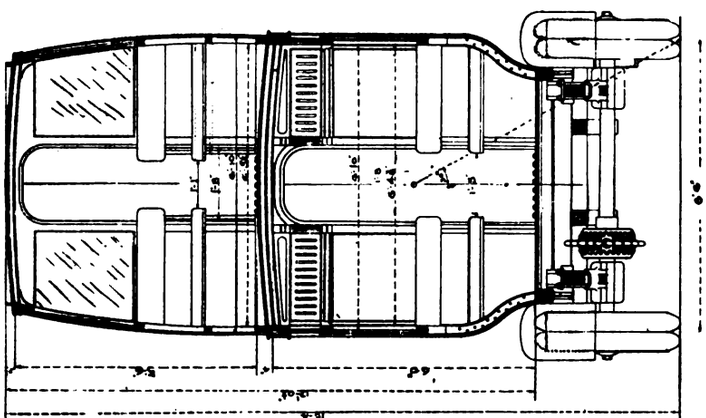


End Elevation and Half Section.



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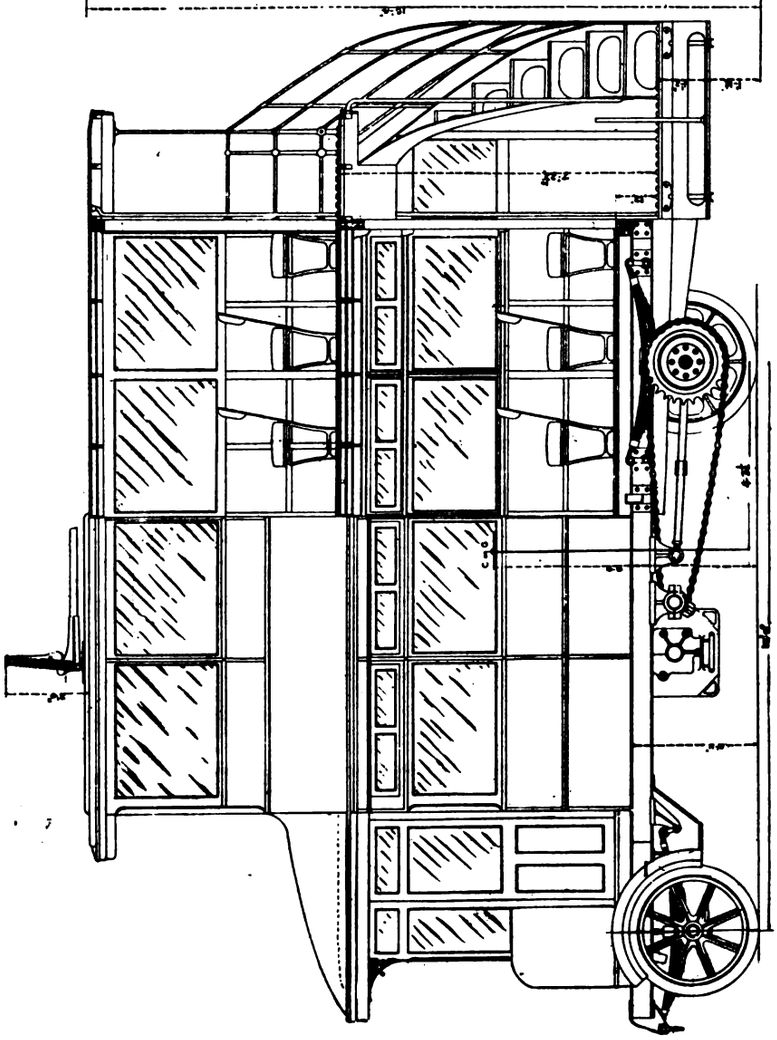
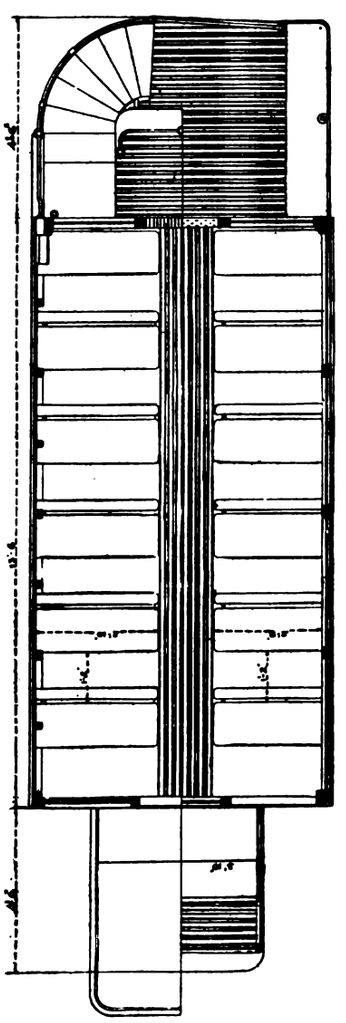


Side Elevation and Half Section.

A Double-Deck Railless Car, Designed by Mr. R. H. Wilkinson, General Manager, Bradford Corporation Tramways.



Plan.

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THE EDITOR will be glad to consider articles by experts. All information of a practical character relating particularly to the engineering and operating branches of transportation will receive prompt attention. Original illustrations will also be welcome.

LONDON, FEBRUARY 12, 1920.

Vertical Motor Electric Locomotives.

A number of interesting points in regard to the design of electric locomotives are to be found in a paper read recently before the local branch in Preston of the Institution of Electrical Engineers by Lieut.-Col. H. E. O'Brien, assistant mechanical engineer of the Lancashire and Yorkshire Railway. The subject of the paper was the application of the electric locomotive to main line traction, and it contained one suggestion of special interest of which more is likely to be heard in future. Referring to the low centre of gravity of the geared electric locomotive, as compared with that of the steam engine, and to the excessive wear on curves arising therefrom, Colonel O'Brien said that as long as the geared design of motor is adhered to, the only possible method of increasing the height of the centre of gravity is to rotate the motor into a vertical position. This involves carrying a very heavy dead weight on the axle, and a compromise is to tilt the motor to 45 deg. Evidently Colonel O'Brien's suggestion involves the use of worm gearing between the vertical or inclined armature axle and the driving wheels' axle of the locomotive. Nothing of the sort seems hitherto to have been tried in practice, but there appears to be no reason why it should not be attempted. The arrangement would probably be preferable to that adopted several years ago by the Pennsylvania Railroad Company for their locomotives which work through the Hudson River tunnels. There the motor is mounted right up on the floor of the cab, and from the axle of the armature a connecting rod runs down to a counter shaft. From the latter other connecting rods go to the driving wheels. This scheme involves not only a large and heavy slow-speed motor, but also a conversion of rotary into reciprocal motion and back again to rotary. The same objection applies, except as regards the slow-speed motor, to the Bernina Railway locomotive, where two motors are mounted very high and geared to counter shafts whose disc cranks are joined by a rod and are connected by other rods with the driving wheels. It is notable to find along with these designs some of the newest electric locomotives in America having the motor armature mounted round the driving axle, a method used years ago on the City and South London Railway, and one which brings the centre of gravity about as low as it possibly can be. In the early days of steam railways a low centre of gravity was deemed essential for safety with locomotives, but the mistake was found out and the centre of gravity has continually gone higher. So it may be with the electric locomotive, which is yet in some respects only in the experimental stage, unless, of course, practical difficulties should prove insuperable. Traction engineers will do well to keep their eyes on the possibilities of a locomotive with vertical or inclined motors.

Underground Railway Speeds.

The London underground electric railways, ever since their inception, have been remarkable for the high average speed of the trains in relation to the frequency of stops at stations. From time to time, by various devices, the speed has been gradually increased, and it can compare well with that of any other service with similar stops in the world. The new rolling stock now on order for the Metropolitan District Railway, and that of which delivery has begun for the Metropolitan Railway, should by its added facilities for ingress and egress of passengers further reduce the duration of stops at stations and so raise

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the average speed. High acceleration and retardation have been carried far, and there is a promise that they will go farther. The recent institution of the "hurry-up man" or "train hustler," to which we have previously referred, has now been extended to three stations—Victoria, Charing Cross, and Tottenham Court Road—and will probably be applied to more. The results have been material in reducing the duration of station stops. Parenthetically it may be remarked that the London County Council tramcar despatchers at loading-up points seem to be more energetic in getting the cars away quickly. The Council have offered "the Underground" flattery by means of imitation in more ways than one. At all events, there are some instructive figures available, which are published in this issue, of present schedule speeds on the underground railways. The most remarkable is the run of the fast trains from Mansion House to Ealing, a distance of 10·9 miles. The trains stop at ten stations and perform the journey in 27 minutes, giving an average speed of no less than 24·2 miles an hour. Other performances, in proportion to the number of stops, are equally good.

The Council and the Industry.

Many shareholders in tramway companies and members of Town Councils owning tramways are asking what the Joint Industrial Council for the industry is doing. It is now several months since this body was formed, and great hopes were entertained of it. There was an idea—it may have been ill-founded—that much of the proceedings of the Council, and certainly all decisions reached, would promptly be made known. At the least it was fully expected that official communications would be issued as to the work it had in hand and in regard to what was being achieved. But the "silence of death" has fallen over its proceedings, and whether it is doing any good or not few can say. It is to be observed that so far at any rate the formation of the Council has not brought any nearer a condition of unanimity as regards wages or hours. Tramway employees in different localities continue to make emergent demands, and tramway authorities continue to deal with these demands in the way that seems most expedient to them. The fact that about the time of the constitution of the Council a national settlement was reached as regards terms of employment might have led one to suppose that there would be a lull at all events in sporadic local outbreaks of requests for more pay or less work, especially as it was and is so well known that many of the tramway undertakings are staggering under a load of expenses greater than they can bear. It is in such circumstances that the insatiable call comes for more, more. The need for definite and vigorous action by the Council is urgent, and it is no less necessary that all concerned in the industry should be informed as to what the Council is doing.

Order Out of Chaos.

If a certain London Borough Council with a Labour majority had given more time to reflection they might have avoided making themselves ridiculous in their views regarding the control of Metropolitan traffic and transport. The Council protested against those matters being "taken out of the hands of the elected authorities of London and placed in the hands of a non-elected, unrepresentative body." There is no excuse for so woeful a display as is shown in that resolution. Readers of daily newspapers know that the excellent work accomplished during the past twelve weeks in securing more expeditious working of public passenger and other traffic has emanated not from a permanent Board, but from an Advisory Committee appointed by the Ministry of Transport. The committee is composed of representatives chosen by the County Council, omnibus and railway companies, motor organisations, horse haulage interests, labour, and the police. In reality the task appertains to police duty, and of late years the predecessor of the present Commissioner had attempted to introduce some of the changes which the Advisory Committee are now effecting without any trouble. The reason for his failure was that he endeavoured to do all the work "off his own bat" while showing little sympathy towards the desire for the formation of passenger queues, which are now becoming common. Two reasons have operated to secure the more sensible method of working through an Advisory Committee. The first was the extra congestion of the streets during the railway strike; the second the

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existence of the Ministry of Transport. For the latter to have allowed a year to pass without tackling such aspects of the traffic problem as laid ready to their hands would have been inexcusable. Sir E. Geddes took a wise course in offering traffic organisations an opportunity of placing their house in order before Greater London is given a Traffic Board. The experience already gained of harmonious working augurs well for acceptance of the legislation that will be necessary for bringing the Traffic Board into existence.

Employees on Car Economies.

What seems to have been an innovation, even for America, was witnessed at the Winter Convention of the Central Electric Railway Association, held at Grand Rapids, Michigan. Papers dealing with economies in car operation were presented by all ranks connected with the working of street electric railways. The authors included a conductor and a motorman, and their papers are given in the December issue of *Electric Traction* (Chicago). Two practical men as the motorman and conductor showed themselves to be, their papers make no effort to achieve the unattainable, but set forth home truths that ought to circulate on the tables of every depot reading room. Conductor Conley remarks that on first thoughts the opportunities of a conductor for contributing to the economies of operation would appear to be rather limited, but if the employee will conscientiously avail himself of the opportunities presented he will find that he is able to add very materially to economical operation. Mr. Conley invests the book of rules and regulations with an interest which it is desirable that all conductors should share, for, as he says, the rules and regulations are intended to cover practically every emergency that may arise. Then he briefly enumerates the opportunities presented for the practice of economy, and sums up by stating that the basic requirement is the right use of plain common sense. As he observes, the trouble is that some men do not do their best, and to everyone he gives the exhortation "Do better." British conductors, or the majority of them who do not have to deal with parcels, might bear in mind that their lot is cast in more pleasant places than is the case with their counterpart in the U.S.A., where the handling of freight, express, baggage and mails forms no inconsiderable part of the business. Motorman Sunderland's paper extends to three columns, and it is but bare justice to the author to say that every sentence should be pondered over and put into practice. He aims high by insisting that every motorman by means of "sound judgment, good common sense, and interest in his work—as well as his pay, coupled with a desire to lead in his profession—can save money for his company." The final sentence of each paper should be inscribed in the rules book of every employee. After recounting the qualities of a good conductor, Mr. Conley urges his confreres "not to be afraid of doing a little more than your share," and concludes—"The conductor will then find that when, in order to secure greater economy in car operation, it is necessary to reduce the number of men, his name will still be upon the pay-roll." The motorman, animated by the pride that drivers of the giants of the steam road unconsciously display in their locomotives, says—"Every effort brings its own fitting reward. There is a good deal of honest pleasure in climbing down from the front end and walking around the car at the end of a splendid run and finding the car cool and in good order. It is then that we realise that no mechanical means can ever take the place of a motorman." The sentiments of the two men may be commended to trade union leaders in this country who oppose payments of a bonus to motormen and conductors.

INCREASED FARES IN CHICAGO.

THE PUBLIC PAYS WITHOUT PROTEST.

Amid the agitation against increased fares in London and other English cities, it is quite refreshing to learn that when the fares on the street surface lines of Chicago were recently increased from 5 cents to 7 cents the public of that city realised that the advance was requisite to retrieve the position of the company, and paid practically without protest. This is as it should be. Facilities for locomotion are part and parcel of the organisation of the community, and, so long as the price charged for them is in equitable ratio to the cost of operation, it is for the public, which is always demanding efficient service, to pay that price. The cost of operation in America has risen very much on the lines that it has in this country. In many American cities the street surface lines—as the tramways are termed—have also to meet much higher municipal charges than is the case here. In Chicago, for instance, not only does the tramway undertaking have to maintain and repave its right-of-way, or track, but it has also to clean and sprinkle the streets traversed, pay the fees of city inspectors and expenses of Board of Supervising Engineers, and, in addition, disburse 55 per cent. of its divisible net receipts to the city. During the nine years up to and including 1918, the Chicago surface lines contributed £723,000 annually to the public funds in respect to the foregoing charges, and that quite irrespective of the general taxes.

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SNOW FIGHTING IN MONTREAL.

By W. T. Robson.

When visiting foreign tramway systems, it is certainly a stroke of fortune to be present at a time of stress, and in witnessing the not unusual sight of a Canadian snowstorm, one has a splendid opportunity of admiring the methods adopted by what is probably the most perfect organisation in the world for dealing with the snow enemy.

Montreal is called "Our Lady of the Snows," and justifies the name by an average snowfall of 120 in. between December and March. Falls of 18 and 20 in. are not uncommon, with drifts and banks of 6 ft., so it is obvious that a wonderfully efficient organisation is required to maintain the proud record of never having been snowed up.

It was interesting to find snow in its different forms classified, with a specific treatment for each, the late-season snows, damp enough to cause an ice coating on the rail, requiring the most drastic measures.

In this instance, with the thermometer 20 deg. below zero, the snow was dry and powdery, and so easily dealt with.

The organisation begins with recording barometers in the superintendent's house, office, and snow headquarters, and by long experience these can be depended upon to give timely warning of troubles to come. If snow is expected, call-boys are held in readiness at each depot, and with the first flake the crews are called out to their respective posts. Long before this the superintendent is at his snow headquarters, and has warned each depot to have equipment shunted so that each unit is clear of other rolling stock and ready to turn out on the arrival of the crews.

The city is divided into four districts, and each of these has its own self-contained operations of sweeping, levelling, salting, point cleaning, and fender and vestibule glass cleaning.

The superintendent takes entire charge and directs operations from snow headquarters. Divisional superintendents control the work in their particular areas, telephoning frequently to headquarters to report progress, and all these reports are systematically entered in a log-book, so that the superintendent can see at a glance how things are going and divert a sweeper from one route to another in case of necessity. The men in charge of the sweepers also report by telephone at certain points, and altogether calls average 70 to 80 per hour, so it will be seen that the log is a comprehensive one.

The equipment is necessarily on a grand scale and consists of 39 sweepers, 7 ploughs, 12 levellers (or wing cars), and 10 salt cars. In addition, all service cars are fitted with rail scrapers, which do invaluable service in preventing the accumulation of snow if falling during running hours. The sweepers themselves are provided with wings which clear the roadway 6 ft. from the rail, but owing to an obligation to assist in snow removal from the road altogether, these are followed by the levellers—freight cars fitted with heavy iron wings—which push the snow still further back, practically to the edge of the pavement, from where it is carted away on sleighs after the storm is over.

It is interesting to note that each motorman retains his own particular unit for the season, and also follows the same route, thus becoming familiarised with any danger point and any good or bad feature of his equipment. Each sweeper completes its circuit in roughly 45 minutes, and routes are arranged so as to give a central conveying point, so as to save time should help be needed. Before the snow season starts, a meeting is called by the superintendent, at which district superintendents and sweeper drivers are asked to offer suggestions for consideration, and the plan of action is clearly defined, each man knowing what he has to do without wasting time at a critical moment asking for instructions.

In this particular instance the snowfall was only 12 in., and owing to a temperature well below zero, was powdery, non-adhesive, and easily dealt with by this wonderful organisation.

The fullest arrangements are made for the comfort of all the men engaged in the work, and cars fitted up as coffee vans are sent out to provide for their material needs. As storms sometimes continue for 36 hours, the need for these is obvious.

The most wonderful thing of all is the intense loyalty and "esprit de corps" of the whole snow-fighting department. It is not sufficient for each man to do his duty and no more; there are times when it is necessary to be a super-man, and the joy and pride of being a part of a perfectly organised and conquering fighting force is clearly displayed by everyone, from the superintendent to the pointsman.

Extra payment is, of course, made, but the real reward clearly lies in the piled up snow at the sides of the roads and the practically uninterrupted car service.

LONDON UNDERGROUND RAILWAY SPEEDS.

We are indebted to Mr. Thornton, superintendent of the line for the London Underground Railways, for the accompanying interesting table showing the average speeds of trains over the distances and with the number of station stops mentioned. Efforts are continually being made to raise these speeds, and so the time occupied by any given journey is gradually going down. There is an appreciable difference on the routes where "hurry-up" men have been provided. It will be noted that the average speed is in inverse proportion to the number of stops per mile. Two examples are given (both on the same route) for the District Railway, one of a fast and the other of a slower train. The effect of reducing the number of station stops is also well shown in the case of the fast theatre trains on the Charing Cross and Hampstead Railway. In regard to the lower speed on the City and South London Railway, the stops are exceptionally numerous, and it has to be remembered that the trains are hauled by electric locomotives instead of being equipped and driven on the multiple-unit system. On all the other lines the rate of acceleration on leaving each station is very high, and the pull up on stopping is sharp. Even better results are expected with new rolling stock now on order both as to acceleration and as to duration of stops. By way of comparison it may be noted that in the days when steam locomotives were used on the District Railway, the average train speed was 13·65 miles an hour. That was good in the circumstances.

	Distance. Miles.	Station Stops.	Time. Minutes.	Average Speed. Miles per Hour.
Mansion House to Ealing	10·9	9	27	24·2
Mansion House to Ealing...	10·9	16	34	19·23
Elephant and Castle to Watford ...	20·8	26	62	20·13
Hammersmith to Finsbury Park ...	8·9	14	30	17·78
Charing Cross to Golders Green	6·1	11	21	17·47
Charing Cross to Golders Green (Theatre)	6·1	4	16	22·84
Charing Cross to Highgate	4·4	11	17	15·55
Charing Cross to Highgate (Theatre) ...	4·4	3	12	22·15
Liverpool Street to Wood Lane ...	6·8	13	24	17·0
Clapham Common to Euston	7·3	13	32	13·69

British Railway Electrification.—It is understood that the Minister of Transport is engaged in the formation of a committee to consider generally the electrification of railways in this country. The names of the committee will probably be announced shortly.

Tramway Speed Limits.—The London United Tramways Company are asking the Board of Trade to sanction a maximum speed limit of 16 miles an hour. The Hammersmith Council urge that the limit should be 12 miles an hour.

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DUFF-BARRATT CAR JACKS.

We have received from the Duff Jack Sales Company, Limited, of Oxford Circus House, Oxford Street, London, W.1, a range of catalogues which fully confirm the statement made by the manufacturing company that they can supply a jack suitable for any and every purpose. The company's complete line of jacks includes over 500 sizes and types, from the universal auto jacks to the monster hydraulics with a lifting capacity of 500 tons and upwards. The catalogues, however, treat only of the types and sizes most generally used in the traction and allied industries, but in this particular class a very wide range is shown, so that the selection of a jack to fill the requirements of any desired lift is a comparatively easy matter to those possessing the Duff catalogues.

The Duff Manufacturing Company have devoted upwards of 35 years exclusively to jack building. and they claim that their jacks possess the essential qualities of easy operation, quick lift, and safety. Amongst the many types that find favour in the tramway and railway field are the Duff improved ball bearing journal jack. This has a lifting capacity of 15 tons, and owing to the use of ball bearings, and the accurate machine finish to every moving part, is exceptionally easy to operate. It is specially designed for use in inspecting, removing, and replacing journal brasses. A heavier type of the same jack with a lifting capacity of 25 tons is also illustrated. A handy type of jack suitable for carrying on tramcars is the Duff telescope screw jack. Although only weighing 40 lbs., this jack has a capacity of 15 tons and a lift of 7 inches, the height when closed being 8 inches. Owing to the ratchet and handle construction, the jack can be used in close quarters, while the lift is twice as fast as the ordinary type of jack.

Another type shown is the "Barratt" automatic lowering jack. This is extensively used by contractors and others, as well as tramway men, as a general purpose jack. It has a capacity of 10 tons, and, being double-acting, the load is moved up or down half a notch on both the upward and downward strokes of the lever, the direction being determined by an eccentric at the side of the frame. The height of this jack when down is 21 inches, and it has a lift of 10 inches.

The accompanying illustrations show the "Barratt" emergency jack in three positions, as used with a tramcar mounted upon a standard Brill truck. This type of jack has a forged steel claw mounted upon the head of the lifting bar. It is attached on the ball and socket principle, and is therefore free to swivel sideways 120 deg. and out from the base when the latter is set in an inclined position to the extent of 15 deg., a special feature being that the full rated capacity of the jack—15 tons—may be lifted on the claw.

In Fig. 1 the jack is shown in an inclined position, with the full weight on the tip of the claw, the wheels being clear of the track. In this position a derailed car would be moved horizontally to the track immediately a corresponding lift was operated on the opposite side of the car. Fig. 2 illustrates the ordinary method of operating the jack when plenty of space is available for the free movement of the lever. Fig. 3 shows a similar operation, but with the body of the jack so turned that the lever arm is parallel with the car. It will be seen from these illustrations that the great advantage of this type of jack comes from the fact that it can be easily operated to its fullest capacity in the most confined space.

The total height of the jack when lowered is 22 inches, and of the claw 3 inches, the total lift being 10½ inches. The important working parts are constructed of drop-forged steel, while the main lifting parts are of chrome nickel steel, specially heat treated. It will thus be seen that the maximum strength is obtained with the minimum weight. The automatic lowering system is also adopted in this model. In the heavier type of jacks for railway uses a number of different designs are shown in the catalogue, with plate illustrations of the mechanism of the 35, 50, and 75 ton high speed jacks.

The repair part catalogue is a handsomely illustrated booklet of some 60 pages, and forms a comprehensive description of all the working parts of the leading types. Each part is separately illustrated and numbered, so that by merely quoting the part number and type replacements are quickly obtainable.

Copies of all or either of the catalogues will be forwarded on request by the Duff Jack Sales Company.

LONDON TRAMWAY EXTENSIONS.

Owing to the outbreak of the war the London County Council were prevented in 1914 from carrying out the linking of the Embankment-Lee Green tramways with the line from Eltham to Woolwich. Had the extension been permitted by the Treasury it would have greatly facilitated the transport of munition workers to the Arsenal. The Council have now taken steps towards the execution of the work by placing a contract with Clough, Smith and Company, Limited, at £8,650, for the installation of the overhead electrical equipment. The other tenders for that work were £9,838 and £11,323. For the low tension electric cables required on the route there were eight tenders, and the contract was placed with the Western Electric Company, Limited, at £23,803, this being the lowest quotation. The highest was £25,593.

Approval has been given by the County Council to the electrification of the disused horse tramways from East India Dock Road, Poplar, to Mare Street, Hackney, now that Stepney Borough Council have removed their veto against the use of the overhead system. The change is due to the Labour Party having gained control on the borough authority. The estimated total cost of the work is £272,000, as against £110,000 in 1915. In this case the exercise of the Borough Council's veto not only put the public to great inconvenience for a decade, but led to great waste of public money.

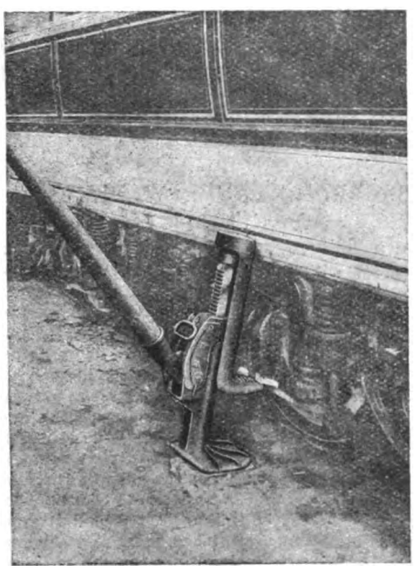

Fig. 1.

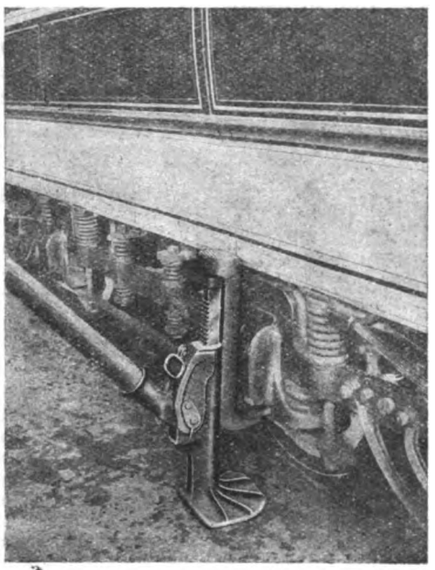

Fig. 2.

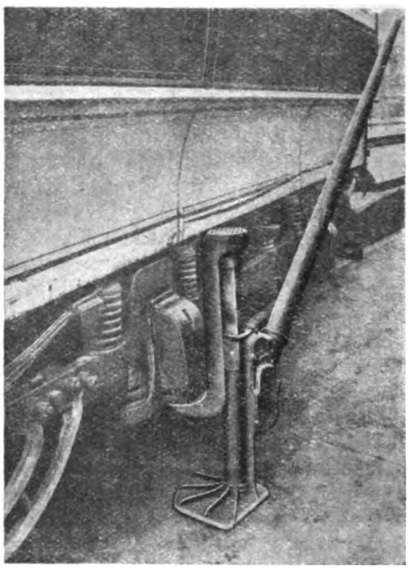

Fig. 3.

The Duff-Barratt Emergency Jack.

RAILWAY ELECTRIFICATION SCHEMES.

BELGIUM.—Some time ago the Belgian Government decided to adopt electric traction for the State railways. The first line to be taken in hand will be that from Brussels to Antwerp, a distance of about 30 miles.

BUENOS AYRES.—The Western Railway is to electrify its lines from Buenos Ayres to Castelar, a distance of about twenty miles, at an approximate cost of £1,000,000. It is stated that the Southern Railway is planning to electrify its line to La Plata.

GREAT EASTERN RAILWAY.—Edmonton District Council has received a letter from the Great Eastern Railway Company stating that good progress has been made with the scheme for electrifying the Enfield branch line from Liverpool Street Station.

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THE ENGLISH ELECTRIC JOURNAL.

The English Electric Journal, the first number of which has been published, is an unusually interesting and attractive "house" magazine, and all concerned in electrical matters will find in it an especial appeal to them. This new publication is specially interesting from the fact that it is issued by that great amalgamation known as the English Electric Company, Limited, which includes such well-known firms in the electrical industry as Dick, Kerr and Company, Siemens Brothers and Company, and Willans and Robinson. Under one management these firms have consolidated their energies in order to compete on something like equal terms with the great American combinations. Possessed of a capital of approximately £3,000,000, the company is a purely British one, and controls the following important works—The Dick Kerr Works, Preston; the Ordnance Works, Coventry; the Phœnix Works, Bradford; the Siemens Works, Stafford; and the Willans Works, Rugby.

As the official organ of such vast interests, *The English Electric Journal* starts on its career with a great advantage. Appropriately enough the journal devotes an introductory article to a statement explaining the objects and ambitions of the new combination. "The firm," states the journal, "specialising in a single product has given way to the group covering the whole range of electrical manufacture with world-wide ramifications." The English Electric Company has been formed to meet this new development, and with its great works capacity and vast contracting experience it is well equipped for the purpose.

In its first number the journal commences an interesting series of articles on the several works controlled by the company. The series is inaugurated by a description of the Coventry works, in which suitable reference is made to their wonderful achievements during the war. The article on the electrification of the Lancashire and Yorkshire Railway, with which the Dick Kerr Company were identified, is apposite as illustrating what even one partner of the combine can do. The Zweigbergk system of multiple train control is reviewed and explained in another informative article. Throughout the journal is illustrated with several admirable half-tone pictures and diagrams. Printed on fine paper, its general "get-up" is a credit to the producers, and promises well for future issues. In these the new developments and special products of the company will be dealt with, and we shall look forward to them with no little interest.

FINANCIAL REPORTS AND MEETINGS.

BLACKPOOL CORPORATION TRAMWAYS show a profit of £15,000 for the year, which is equivalent to 17 per cent. on the capital of the undertaking. Allowing for interest and sinking fund charges, the balance amounts to 10 per cent.

BLACKPOOL, ST. ANNE'S, AND LYTHAM TRAMWAYS.—The accounts for the year ended October 31, 1919, show a profit of £10,060. After providing for debenture stock, interest, and sinking fund, a debit balance of £37,891 is carried forward.

MELBOURNE TRAMWAYS AND OMNIBUS COMPANY.—The agent in London for the liquidator of the Melbourne Tramways and Omnibus Company, Limited, has received cable instructions from the liquidator in Melbourne to pay a final dividend on 9 3-10d. per share.

CITY OF BUENOS AYRES TRAMWAYS COMPANY.—The directors have recommended the payment of a balance dividend of 1s. 3d. per share, making 5 per cent. per annum, less tax. The sum of £6,200 was transferred to the general reserve amortisation fund, carrying forward £138.

THE BLACKPOOL AND FLEETWOOD TRAMROAD COMPANY, LIMITED.—The undertaking of this company having been sold to Blackpool Corporation, a distribution is being made to shareholders at the rate of £15 per share. Of this sum £10 is the return to the shareholders of their original capital and £5 is on account of surplus assets. There remain certain assets which are still to be realised and their value distributed.

LIVERPOOL OVERHEAD RAILWAY COMPANY.—The directors have resolved to recommend the payment of a final dividend (for the half-year ended 31 December last) at the rate of 5 per cent. per annum (less income tax) on the preference shares, and 4 per cent. per annum (less income tax) on the ordinary shares, making for the year 5 per cent. on the preference shares and 3¼ per cent. on the ordinary shares. The meeting of shareholders is to be held on February 24.

YORKSHIRE (WEST RIDING) ELECTRIC TRAMWAYS.—The directors' report for the year ended December 31, 1919, states that the operations for the past six months, after providing for debenture interest, resulted in a net income of £42,671 (a year ago the net income was £15,302). Adding the amount of £2,526 brought forward from last year, the available balance is £45,197. This sum has been appropriated as follows:—Dividend of 6 per cent. per annum, less income tax, on the 6 per cent. cumulative preference shares, £9,715; purchase of funded preferential dividend certificates, £12,837; renewals, depreciation, reserve fund in lieu of accident insurance, and general reserve fund, £21,259, leaving a balance of £1,386 to be carried forward. The gross income amounted to £157,086, an increase of £16,519, as compared with the previous year, while the operating expenses increased from £74,683 to £92,172.

THE ANGLO-ARGENTINE TRAMWAYS COMPANY'S financial year closed in December. The traffic returns for 1919 show an increase over the previous year of £191,000. This amount in normal times would ensure a substantial increase in the net earnings, but in view of the great increase in the cost of material and wages which all Argentine concerns have had to meet, it is doubtful if much of the increased revenue will be retained. The results to the shareholders are not likely, therefore, to be any better than in the previous year, when no dividends were paid on either the ordinary or the preference shares. A profit balance of £17,000 was carried forward. As mentioned in a recent issue, the company has been authorised to charge a 12 cent. fare for any distance, instead of 10 cents. If all the traffic is maintained, this will amount to an increase of 20 per cent in earnings, and the current year should, therefore, show a substantial improvement.

NEWCASTLE CORPORATION TRAMWAYS.—In his annual report for the year ended March 31, 1919, Mr. Ernest Hatton, engineer and general manager of Newcastle Corporation Tramways, states that the receipts, which were the highest on record, amounted to £472,094, while the earnings per car-mile were 18·94d., as compared with 16·82d. for the previous year. On the other hand it must not be overlooked that the expenses of operation have increased at a greater ratio than the receipts, and further increases of wages have since been granted to the men. No revision of fares to meet these ever-growing expenses has yet been considered by the Tramways Committee, but the limits have now been reached with the present fares and any further increase in the cost of operation or a decrease in the receipts will have an adverse effect on the undertaking. When the report was written, the undertaking was the only municipal tramway system in England which had not been compelled to increase its fares. "What the future holds for the tramway industry it is," Mr. Hatton adds, "impossible to forecast."

DUBLIN UNITED TRAMWAYS COMPANY.—The report for the year ended December 31, 1919, is summarised below in comparison with the three preceding years. The amount available for division at December 31 last was £148,271. Interim dividends amounting to £24,150 were paid in August last. The directors recommend a dividend of 6 per cent. per annum, less income tax, on the preference shares for the half year, and a final dividend at the rate of 7 per cent. per annum, less income tax (making 6 per cent. for the year) for the half year, together with a bonus of one shilling and sixpence, free of income tax, per £10 unit of ordinary stock, setting aside £57,000 towards deferred renewal of rails and cars, and adding £12,321 to the general reserve fund. These appropriations, together with £4,000 to be written off the price of investments, bringing them to their present market value, absorb £131,191, leaving £17,080 to be carried to the next account.

	1919.	1918.	1917.	1916.
RECEIPTS—	£	£	£	£
Traffic receipts	559,501	443,401	353,838	319,612
Parcels delivery	10,054	7,725	7,313	6,987
Advertisements	3,908	3,742	3,697	3,980
Carriage of goods	4,553	3,635	2,361	2,094
Other receipts	2,620	2,653	2,727	2,662
Total receipts	580,636	461,156	369,936	335,335
EXPENSES—				
Working and general	374,541	310,946	243,152	213,587
National insurance	900	877	900	915
Repairs to cottages	1,677	1,454	1,387	1,191
Parcel delivery	7,704	6,364	5,146	4,143
Goods carriage	2,815	2,293	1,366	1,025
Total expenses	387,637	321,934	251,951	220,861
Balance on working	192,999	139,222	117,985	114,474
Balance from last account	13,263	13,461	13,359	13,045
Interest	6,880	2,842	1,636	1,650
Total balance	213,122	155,525	132,980	129,169
DEDUCTIONS—				
Interest on debentures	20,719	20,490	21,498	22,868
Wayleaves	11,058	11,247	11,798	12,107
Payment to Howth Co.	3,000	3,000	3,000	3,000
Renewals, etc.	30,074	3,295	450	—
	64,851	38,032	36,744	37,975
Balance available for division	148,271	117,493	96,236	91,194
Div. on Pref. shares, 6 per cent. for year	25,200	25,650	27,000	27,900
Interim div. on Ord. shares for half year	11,550 (5% p. ann.)	9,570 (4% p. ann.)	9,900 (4% p. ann.)	10,560 (4% p. ann.)
Final div. on Ord. shares	16,170 (7% p. ann.)	13,860 (6% p. ann.)	12,375 (5% p. ann.)	12,375 (5% p. ann.)
Bonus on Ord. shares	4,950	3,300	—	—
Reserve for renewals of permanent way	30,000	35,000	15,000	20,000
Reserve and renewals fund	39,321	15,000	7,000	7,000
Balance to next account	17,080	13,263	13,461	13,359
Written off investments	4,000	1,850	11,500	—
	148,271	117,493	96,236	91,194
Car mileage	6,926,331	6,787,654	7,732,897	7,440,614
Energy consumption	12,897,394	12,303,241	14,062,350	13,007,405

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PERSONAL.

Sir Albert Stanley, upon whom a peerage was recently conferred, has assumed the title of Baron Ashfield, of Southwell, in the County of Nottingham.

Mr. William Cramp has been elected by the Council of the University of Birmingham to fill the Chair of Electrical Engineering recently vacated by Dr. Kapp.

Mr. F. Walton, of Bradford, has been appointed general constructional engineering assistant of the Southend-on-Sea Corporation Electricity Works, at a salary of £400 per annum.

Mr. G. F. Craven, who has resigned the position of general manager and engineer of the Reading Corporation Tramways, has joined the board of Allen and Simmonds (Reading), Limited.

Mr. Robert Birkett, borough electrical engineer and general manager of the Southend Corporation Tramways, has been granted an increase in salary from £1,000 to £1,200 per annum as from July 1 last, rising by annual increments to £1,500.

Mr. A. R. Fearnley, general manager, Sheffield Corporation Tramways and Motors, has been retained by the Edinburgh Corporation in connection with their extension of tramways and omnibuses schemes in the city and surrounding districts.

Mr. A. C. Soutter, who has been connected with the Tudor Accumulator Company for many years, is now in charge of the London office of the company. Mr. Edwin Jacob, who, as recently reported, resigned his position as managing director, is devoting his attention to the Rail Welding Company.

Alderman W. Thompson, who has attained the age of 86 years, has retired from the chairmanship of the Blackburn Electricity and Tramways Committee. He has served as chairman for over twenty years. Councillor Charles Higham, who has been vice-chairman, has been appointed chairman.

Sir Charles W. Starmer, chairman of the Darlington Corporation Tramways Committee, has accepted the invitation of the chairman of the Electricity Supply Committees of the North-east Coast to represent them on the special committee appointed by the Incorporated Electrical Association to deal with proposals of the Associated Municipal Electrical Engineers.

Mr. Peter Fisher, general manager of Dundee Corporation Tramways, for reasons of health, is about to retire from that position, and it is proposed to appoint him to a new post as "consultant" at a retaining fee of £200 per annum. Applications will then be invited for a successor in the capacity of manager. For this post it is proposed to offer a salary of £600 per annum.

The many friends both in England and in Shanghai of **Capt. F. L. Lawrence, R.F.A.** (works manager of Chamberlain and Hookham, Limited), will be interested to know that the Military Cross awarded to him for distinguished services on November 6 and 7, 1918, while in action near Mons, was presented to him at a local investiture held by H.R.H. Prince Henry at the Birmingham Town Hall.

Manchester Tramways Committee have recommended the following increases in salary—Mr. James Wood, financial superintendent and assistant manager, from £750 to £800; Mr. J. T. Oakes, traffic superintendent, from £600 to £700 per annum by two annual increments of £50 each; Mr. D. G. Mallalieu, permanent way superintendent, from £400 to £500 by two annual increments; Mr. R. Beattie, claims clerk, from £400 to £500 by two annual increments; Mr. G. W. Hancock, parcels superintendent, from £400 to £500 by two annual increments; Mr. J. J. McMahon, chief electrical engineer, from £400, with house, coal, gas and water, to £500 per annum; and Mr. W. Grey, secretary, from £350 to £400 per annum.

Mr. William Marsh, engineer and manager of Brighton Corporation Tramways, has been granted an increase in salary from £500 to £540 as from January of last year, rising in four years to £640. Councillor G. E. Deighton, chairman of the Tramways Committee, said that the tramway manager devoted great energy to his work, yet his salary had been much less than those paid to tramway managers in towns of equal importance and of the same mileage of tramways. A scheme was adopted providing for increases for other officers varying from 4s. to 20s. a week. The rolling stock superintendent, now receiving £4 5s. and a war bonus of 34s., will receive 16s. extra, making £6 15s. in all. The increases are to date from September 5 last.

Mr. F. Dudley Docker, C.B., chairman of the Metropolitan Carriage Wagon and Finance Company, Limited, has been presented, on behalf of the shareholders of the company, with an illuminated address by Sir Hallewell Rogers, M.P., in appreciation of the energy and ability which Mr. Docker has devoted to the affairs of the company during the past seventeen years. The address was accompanied by a sum of money for the provision of scholarships at Birmingham University. These scholarships are to bear Mr. Docker's name and to be open to competition by employees of the Metropolitan Company in subjects selected by Mr. Docker. Mrs. Docker was presented with miniatures of herself and her husband mounted in gold.

TRAMWAY AND LIGHT RAILWAY NOTES.

ASHTON.

ARBITRATION PROCEEDINGS ARRANGED.

Arrangements have been made for the arbitration proceedings between the Oldham, Ashton, and Hyde Tramway Company and the local authorities of Ashton, Hyde, Denton, and Audenshaw to take place in London in February. Among those to give evidence are Mr. J. M. McElroy, of Manchester, and Mr. J. B. Hamilton, of Leeds.

BARROW-IN-FURNESS

PURCHASE OF TRAMWAYS BY THE CORPORATION.

The Ministry of Transport has sanctioned the borrowing of £107,750 by Barrow Town Council to enable them to purchase the Barrow Tramway Company's undertaking. The loan period is thirty years, the maximum permitted by the Tramways Act and the Ministry has stipulated that in addition to the sinking fund for the repayment of the loan, an adequate renewals fund must be maintained. The sum of £96,250 has been paid to the tramway company, which relinquished possession on January 1.

BATH.

FALL OF CHIMNEY AT THE TRAMWAY POWER STATION.

During the gale on January 11, the top of the steel chimney of the Bath electric tramways power-station in Walcot Street was blown down. A witness of the occurrence says that the whole of the upper part of the chimney, which was one of the most noticeable objects in that part of the district, swayed and suddenly toppled over, falling with a terrific crash. The chimney stood 120 ft. from the ground, and fell upon the roof of the boiler house, and the ½-in. steel of the shaft was smashed on striking the roof. Little damage was done inside the boiler house and no one was hurt, as the roof withstood the shock. Only about 12 ft of the top of the chimney was blown away, the larger portion remaining, and the work of the station was not interfered with. The chimney had been in use about seventeen years.

BIRMINGHAM.

EXTENSION WITH INDEPENDENT TRACK LAID ON SLEEPERS.

The construction of a new tramway route along Salford Bridge Road, Birmingham, to the Kingsbury Road, Bromford Bridge, has been commenced, and it is hoped that a service can be given by June next. The Dunlop Rubber Company having erected large works in the vicinity, the extension has become urgent. The line will be two miles in length, and the rails are being laid on sleepers on an independent track free from other traffic with a carriage way on either side.

CARDIFF.

MORE CARS REQUIRED.

At a meeting of the City Council, Sir John Courtis, in reply to complaints of the shortage of cars, stated that the Tramways Committee could not yet obtain more cars, but that these would be provided as soon as possible. The Tramways Committee knew all about the queue system, but queues did not provide accommodation. The committee were doing everything possible to provide greater facilities.

DONCASTER.

BOY KILLED WHEN LEANING FROM THE UPPER DECK.

A boy of nine was fatally injured on a Doncaster Corporation car on January 25. He was rising on the front upper deck and was apparently leaning over when the car was passing a loop. A car coming in the opposite direction struck his head and he was so badly injured that he died on the way to the infirmary.

DUNDEE.

DELAY IN OBTAINING NEW CARS ON ORDER.

Mr. Peter Fisher, general manager of Dundee Corporation Tramways, at a sitting of the Dundee magistrates on January 21, mentioned that ten new cars had been received, but that he had been advised that it would be six months before the others could be delivered. The moulders' strike had greatly delayed parts of the equipment. The magistrate agreed to grant licenses for the cars, so that they could be put in service as soon as they were ready.

EDINBURGH.

CAR SHORTAGE—LITTLE RELIEF UNTIL ELECTRIFICATION.

REPAIR WORK AND STAFF TRANSFERRED TO TRAMWAY MANAGER.

In reference to local complaints of the working of the cable cars, Mr. R. S. Pilcher, the general manager, has explained that until the cable cars can be scrapped in favour of electric tramways, the Tramways Committee are trying to make the best of a bad job. All the cars at their disposal are running regularly, and at the present time more cars are being operated than when the City took over the service from the company. No more cars can be put in service under existing conditions. Despite the extra cars and the fact that certain cable routes have been speeded up, the overcrowding problem remains, owing to the increasing traffic. During the period the tramways have been under the charge of the Committee they have carried two-and-a-half million more passengers than

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were carried during a similar time by the company. Fifty cars have been fitted with new top covers, the first of which recently came into use, and these will bring additional relief. The Tramways Committee of Edinburgh Town Council have agreed to recommend to the Council that the tramway repair work and the tramway repair staff should be transferred from the burgh engineer to the tramways manager.

HUDDERSFIELD.

MOTOR OWNERS WITHDRAW OPPOSITION TO TRAMWAY EXTENSION.

The Huddersfield Horse and Motor Owners' Association, who recently influenced electors to refuse their sanction to part of the Huddersfield Corporation Bill to acquire new tramway powers have reconsidered their decision. They have been assured that the Corporation do not intend to enter into competition in any way with the carrying trade, or to start business as chars-a-bancs proprietors. The Association, therefore, now propose to withdraw their opposition, and at a special meeting of the Huddersfield Town Council arrangements were made for a poll of the ratepayers to be taken on the question.

IPSWICH.

COMMITTEE INVITE SUGGESTIONS FROM THE PUBLIC.

The Electric Supply and Tramways Committee of Ipswich have stated through the local press that they desire it to be known that they will always welcome any suggestions that users of the tramway service may like to make with the object of increasing its utility. Every suggestion will be acknowledged and will receive the most careful consideration.

LEEDS.

NEW METHODS IN THE PARCEL SERVICE.

A new method has been adopted by the Leeds tramways parcels department for the carrying of market produce. Suburban retailers making their purchases in Kirkgate market in the early morning have hitherto taken their packages with them on the ordinary cars, the conductors charging for them at the time they took the passengers' fares. Under the new arrangement the traders must take their packages to a weighing machine in the market, where between 6 and 9 a.m. a tramway employee will be in attendance to weigh and stamp the packages, and conductors will not be allowed to accept the packages unless they have been stamped. The *Yorkshire Post* says that the service is becoming increasingly popular. Between April, 1918, when the system was inaugurated, and September last, the department dealt with 97,728 parcels, 58,633 parcels being carried during the six months ended September last. Between November, 1918, and September 30, 1919, 23,000 parcels were carried between Leeds and Bradford. A net profit of £300 was made by the parcels department during the last financial year.

LEYTON.

BONUS FOR WORK DURING THE RAILWAY STRIKE.

Leyton Tramways Committee have refused an application for passes for motormen, conductors, and the shed staff to enable them to travel free on the cars when off duty. The Committee have also considered an application for a grant to the tramway employees who worked hard during the railway strike similar to that given to the tramway employees of the London County Council, viz., two days' rest with pay. The committee decided instead that a bonus of 10s. per man should be granted to motormen, conductors, and inspectors.

LIVERPOOL.

A SEPARATE TRAMWAY COMMITTEE—NEW TRACK TO REDUCE CONGESTION.

Liverpool Tramways, Electric Power and Lighting Committee have recommended the City Council to divide the work between two committees, one dealing exclusively with tramway matters, and the other with electric lighting and power. The Council will nominate the members of the new committees. Each committee will appoint its own chairman. The Council has adopted a recommendation introduced by Alderman Fred Smith for the construction of a tramway curve from Church Street into Parker Street, to facilitate the running of the cars during the busy portion of the day to the various suburban termini.

MANCHESTER.

FREE PASSES FOR LEGLESS EX-SOLDIERS.

At the request of the Comrades of the Great War Society, the chairman of the Manchester Corporation Tramways Committee (Alderman J. Bowes) proposes to reconsider the suggestion that free passes should be given to ex-service men who have lost either one or both legs. It was mentioned by Colonel Crosfield, who headed a deputation, that a similar concession had been granted by the Corporations of Oldham, Warrington, Stockport, and other places. Alderman Bowes, who received the deputation, said that free passes had been granted to all men in hospital blue, but the concession was much abused. The deputation replied that whereas men in hospitals had much time on their hands, those in employment had no time for joy riding.

MIDDLESBROUGH.

PROVISIONS FOR POWER SUPPLY.

Middlesbrough Corporation's engineer is preparing a scheme for the provision of cables, etc., required to supply electrical power for the tramways, which were recently purchased by the Corporation.

OLDHAM.

PLATELAYERS WANTED.

The general manager (Mr. William Chamberlain), in reply to some complaints of the condition of the Corporation tramway track, has emphasised the great difficulty in finding platelayers. These were the men required, but if more of them could be found, a large number of other men could be taken on. In view of the fact that so many men wanted work, the Mayor suggested that semi-skilled men might be employed temporarily; but tramway permanent way cannot advantageously be entrusted to amateurs.

PLYMOUTH.

NEW CARS AND OMNIBUSES REQUIRED.

Plymouth Tramways Committee, having considered a report of the general manager (Mr. H. P. Stokes), have recommended the Council to seek Parliamentary powers for an extension of the tramways. The committee have also decided to apply for sanction to borrow £21,000, the estimated cost of fourteen new cars, and an additional sum for the purchase of twenty motor omnibuses. Tenders will be invited for the supply of the latter, with a view to obtaining the vehicles as soon as approval is obtained for raising the loan.

YORK.

ECONOMY OF THE RAILLESS SYSTEM.

At a meeting of the York City Council, Alderman Meyer, chairman of the Tramways Committee, in reply to some criticism of the railless car system now under construction, said that the four railless cars ordered would run about 100,000 miles per annum, and the cost of operation would be 4d. per mile less than that of petrol omnibuses. This would effect a saving of about £1,600 per annum.

CONTRACTS AND ORDERS.

J. W. Courtenay, Limited, of Amberley House, Norfolk Street, London, W.C., have been reappointed sole advertising contractors to the Bradford Corporation Tramways.

Bradford Tramways Committee have accepted the following tenders from the English Electric Company, Limited:—87 standard type car trucks, £19,140; 124 electric tramcar equipments, £43,050; 20 tramcar bodies, £29,300.

Bradford Electricity Committee have accepted the following tenders:—Three 150-K.V A. and two 600-K.V.A. transformers, Ferranti, Limited; three 250-K.V.A. transformers, the Brush Electrical Engineering Company, Limited; two 400-K.V.A. transformers, the British Electrical Transformer Company, Limited; A.C. "B" switch-gear, Bolton Road sub-station (including gear for two additional rotaries and Merz-Price protective gear), A. Reyrolle and Company, Limited.

Sandberg's "Insitu" Rail Hardening Process.—The Derby Corporation have placed an order for the treatment of 4½ miles of track by the Sandberg "Insitu" process. Messrs. Scholey and Company, Limited, 56, Victoria Street, London, S.W.1, as liceneces and contractors, have secured contracts up to date for the treatment of 45 miles of track by the "Insitu" process on the following tramways:—Croydon, Metropolitan Electric Tramways, London, Birmingham, Manchester, Bournemouth, Liverpool, Glasgow, Sheffield, Leeds, Newcastle, Bristol, Derby, and Paris.

BUSINESS NOTICES.

ALLOY WELDING PROCESSES, LIMITED.—The "A.W.P." electrodes have been approved by Lloyds' Register of Shipping and also the British Corporation for the Survey and Registry of Shipping.

Messrs. TURNERS AND MANVILLE, LIMITED, of 3, Hopetoun House, Lloyds Avenue, E.C.3, have changed the title of their company to the Asbestos and Electrical Fittings Company, Limited. No alteration in the organisation or the policy of the company is entailed by the change of name.

PINCHIN, JOHNSON, AND COMPANY, LIMITED.—An amalgamation has been effected between Wilkinson, Heywood, and Clark, Limited, and Pinchin, Johnson, and Company, Limited, and the head office for the joint business is now at General Buildings, Aldwych, London, W.C. (Telephones, City 7840 (5 lines) and Holborn 1361 (2 lines). There will be no change in the policy of either house. The combined experience and facilities of the two houses are very extensive, and the whole organisation will be directed to rendering the fullest service to their customers.

EDISON SWAN NEW HALF-WATT LAMP.—The Edison Swan Electric Company, Limited, have entered into an arrangement with the Phillips Glowlampworks, Limited, which possesses a monopoly for the manufacture of a particular kind of half-watt lamp, by which the latter company acquire approximately an eighth of the issued share capital of the Edison Swan Electric Company. The Edison Swan Company will have the sole rights of sale and manufacture in Great Britain of the lamp referred to. Dr. G. L. F. Phillips and Mr. A. F. Phillips, of the Phillips Glowlampworks, Limited, Eindhoven, Holland, have joined the board of directors of the Edison Swan Electric Company, Limited.

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GREAT EASTERN RAILWAY ELECTRIFICATION.

Presiding at the annual meeting of the Great Eastern Railway on February 6, Sir Ailwyn Fellowes, deputy chairman, said that the Board had instructed the general manager, acting in consultation with other experts, to prepare a scheme of electrification. Sir Henry Thornton, who was devoting much attention to the subject, was of opinion that the suburban zone served by the Great Eastern Railway lent itself more readily to electrification than that in most other suburban areas, because they had a great density of traffic, a number of traffic routes all diverging from one terminus, and an immediate and pressing demand for increased passenger facilities. Investigation had not yet proceeded for enough to permit predictions as to the financial results to the company, but it was hoped that electrification would procure material economies coupled with a large stimulation of traffic.

INCREASE IN FARES.

The Ministry of Transport has declined to allow the Falkirk and District Tramways Company to increase their fares.

LEITH.—The Ministry of Transport have authorised the Leith Tramways Committee to increase the fares by 50 per cent. The fixing of the new scale has been referred to a sub-committee.

THE WOOLLEN DISTRICT.—As the result of a compromise the fares on the Yorkshire (Woollen District) Electric Tramways, Limited, are to be raised. There is to be no alteration of the fares on the existing 1½d. stages. Fares on journeys of more than 1½d. are to be increased by an extra ½d. The price of workmen's tickets is to be raised from ½d. and 1d. respectively to 1d. and 1½d.

DERBY TOWN COUNCIL has decided to reinstate 1d. stages on all routes, but the stages are to be shorter than previously. A number of existing 1½d. stages will be shortened and additional 1½d. stages created. Return tickets for workmen will be issued at a fare of 1d. on all cars leaving up to 8.45 a.m., and these tickets will be available for return at any time. Children's fares will remain as at present. It is stated that since the 1d. stages were abolished last May there has been a decrease of upwards of 50,000 passengers

IPSWICH.—Commencing on February 1, all fares on the Ipswich Tramways were increased. The minimum ordinary fares is 1½d., but the transfer ticket system abandoned during the war will again be put into operation. These transfer tickets will enable the passenger to make a part of the journey on one route and to complete it on another route. The transfer tickets will be of the value of 2d., 2½d., 3d., 3½d. and 4d. As in other towns the increase in fares has become necessary owing to the greatly enhanced working expenses. Workmen's return tickets (two journeys or four journeys) will be available up to 9 a.m., and every tramway passenger who travels in a car before that hour will be able to purchase a 3d. or 6d. workers' return ticket. The 3d. ticket enables the holder to make one journey over any 2½d. fare stage before 9 a.m., and to travel over any similar stage after 4.30 p.m. On Wednesdays and Saturdays the return journey may be made any time after 1 p.m., and 12 noon respectively. A passenger before 9 a.m. thus pays 3d. for a journey which on the ordinary fare schedule would cost 5d., while for 6d. he may purchase a ticket which not only covers the same morning and evening journeys covered by the 3d. ticket, but allows two journeys over the 2½d. stages during the period between 12 noon and 2.30 p.m. The workmen's 6d. ticket thus covers a service which costs the ordinary passenger 10d.

WOLVERHAMPTON TOWN COUNCIL has decided not to reinstate the 1d fare for short distances. The Tramways Committee reported that they were entirely in agreement with the views of the general manager, Mr. C. Owen Silvers, who had dealt with the matter in a special report. As a little hardship might in some instances be created in the case of workmen's fares, they decided in cases where the workmen's return fares were increased 100 per cent to reduce such increase to 50 per cent. Mr. Silvers stated that the running costs in 1913-14 were £33,125, or 6·651d. per car-mile, but in 1918-19, with much increased mileage, the costs were 12·366d. per car-mile. He estimated the cost per passenger would be more than 1½d., and to charge 1d. for these stages would be to carry every passenger at a loss. Mr. Silvers observed that people seemed to have realised that in everything except tramway fares 2d. is now required where 1d. was enough in pre-war times, but their 1d. fares had only been increased by ½d. He had received particulars from the Midland area where the following have adopted the 1½d. minimum fare :—Newport, Derby, Cardiff, Burton, South Staffordshire, Wolverhampton District, Dudley and Stourbridge, and Nottingham. Particulars from municipal tramways in the Kingdom confirmed that fares had been raised on practically all undertakings, and the introduction of the 1½d. minimum is now the usual practice. In conclusion he stated that in his opinion the retention of the 1½d. minimum ordinary fare was essential for the present requirements of the undertaking.

PATENT LIST.

Abstracted for "The Tramway and Railway World" from the Official Journal of Patents.

***** If the inventions have been communicated the names of the communicators are given in italics.**

APPLICATIONS FOR LETTERS PATENT.

The number of the patent is given in brackets.

Brake devices for wheels of motor vehicles (31,098)—M. Birkigt.
Oil-fired apparatus for motor vehicles (31,003)—J. Brown and P. McGinn.
Rubber tires for motor vehicles (31,145)—L. Brown and C. Macintosh and Company.
Electrical signalling apparatus for railways (30,961)—H. A. Bull.
Change-speed gear mechanism for motor vehicles (30,863)—T. L. Carbone.
Direction indicators or signalling devices for motor vehicles (31,101)—B. Colly, H. Hellawell, B. Simpkins, and E. G. Rance.
Self-propelled vehicle, steam generator liquid fuel supply and combustion apparatus (31,250)—F. M. Curror.
Carburettors for motor cars (31,231)—T. A. Evans.
Bogie trucks (30,842)—F. Gibbins and Gloucester Railway Carriage and Wagon Company.
Springing of self-propelled vehicles (31,247)—L. Grillet.
Differential device for motor vehicles (30,752)—C. D. Ingleby.
Radiators for automobiles (30,923)—E. Kemp and C. L. Sladden.
Rail joint (30,750)—R. W. Lundin.
Automatic railway car doors (30,946)—W. N. McClellan.
Lifting jacks (30,996)—G. H. Morris.
Change speed gearing for motor vehicles (30,964)—A. Mort and A. Ramsay.
Electrically propelled road vehicles (31,220)—P. A. H. Mossay, Mossay and Company and Ransomes, Sims and Jefferies.
Apparatus for lighting and starting motor vehicles (30,838)—Newton Brothers and F. Newton.
Variable speed gears (31,270)—H. L. Ollier and W. Sever.
Automatic omnibus seat cover (30,619)—A. Patrick.
Divisible wheels and wheel rims for motor vehicles (31,178)—L. Pearson.
Lifting jacks (30,987)—A. D. Powell.
Fishplates for connecting tracks or tramway lines (31,233)—L. Preston and N. Stanyer.
Life guard for front wheels of motor omnibuses (31,038 and 31,140)—L. Randerson.
Chassis for automobiles (30,713)—L. Renault.
Means for driving magnetos for motor vehicles and controlling ignition thereof (31,180)—C. Roome.
Variable speed gearing (30,888 and 30,889)—A. C. C. Walker.
Lifting jacks (31,166)—A. E. White (*McKiernan-Terry Drill Company*).
Radiators for motor cars (30,897)—J. C. Urie.
Brake mechanism (31,375)—G. S. Ackley.
Self-propelled railway vehicles (31,362)—W. Barrington.
Automobiles (31,382)—F. W. Berwick and Company and M. H. L. Sizaire.
Driving mechanism for motor vehicles (31,461)—A. Bovier and P. E. Delville.
Car lifter (31,509)—P. H. Bowley.
Change-speed driving gear (31,868)—C. H. Caton.
Variable speed and differential gear (31,321)—R. H. Dick.
Means for controlling motor vehicles (31,691)—G. Fornaca.
Rotary mudguard for motor omnibuses (31,352)—G. A. Galloway.
Power transmission mechanism for automobiles (31,962)—C. E. Goodyear and G. Law.
Steering gear of mechanically propelled vehicles (32,020)—A. G. Grice.
Motor vehicle suspensions (31,640)—J. R. Jones.
Change speed mechanism (31,910)—E. Ladetto.
Apparatus for electric traction systems (31,834)—S. McLean and A. Muir.
Mixed electric drive for vehicle equipped with steam turbines, polyphase generators, and asynchronous motors (31,788)—Maschinenfabrik Oerlikon.
Method of controlling polyphase motors on vehicles (31,789)—Maschinenfabrik Oerlikon.
Bodies and coverings of omnibuses, etc. (31,620)—H. J. Murphy.
Device for indicating speed and mileage (31,995)—W. O'Carroll.
Buffer devices for tramway, etc., vehicles (31,677)—S. G. H. Orell.
Electric relays for signalling (31,500)—M. J. Railing.
Electric signalling apparatus (31,501)—M. J. Railing.
Anti-vibratory devices for road vehicles (31,649)—G. J. Sear.
Traffic signal device for motor vehicles (31,366)—H. G. B. Smith.
Starting, lighting, and ignition apparatus of internal combustion engines for motor vehicles (31,710)—N. Stell.
Friction gearing for motor vehicles (31,958)—H. Tasker.
Motor vehicle wheels (31,813)—D. J. Thomas.
Steering trailers (31,467)—J. Thomas.
Variable speed gear (31,502)—A. C. Turner.
Tramway signalling systems (31,570)—P. H. Waller.
Entrances and exits to tramcars, railway cars, etc. (31,545)—F. Windsor.
Control lever mechanism for motor vehicles, etc. (32,782)—British Transmission Company and R. Pentony.
Machines for dressing rails (32,297)—J. W. Eunson and Woods Gilbert Rail Re-modelling Company.

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Driving gear for milling attachment of rail dressing machines (32,298)—J. W. Eunson and Woods Gilbert Rail Re-modelling Company.
Rail joint (32,631)—G. P. Lander and others.
Change-speed gears (32,162)—H. Leigh.
Steering wheels of road vehicles (32,605)—F. Lister and J. H. Lister.
Lifting jacks (32,543)—J. B. Llewellyn.
Lubrication of springs for motor cars, etc. (32,878)—G. H. C. Lumsden.
Change-speed mechanism for motor cars (32,603)—D. M. Kelway-Marendaz.
Automatic steps for tramway or railway vehicles (32,856)—F. Neri.
Combined rear axle and speed gear box (32,079)—F. E. Randle.
Change speed and brake lever lock for motor cars (32,166)—G. Watson.
Spring actuated resilient wheels for motor vehicles (32,266)—E. Whittaker.
Transmission gear for motor vehicles (32,312)—J. S. Wilkerson.
Speedometer for motor vehicles (32,177)—G. Wray.
Friction drive for self-propelled vehicles (6)—R. H. Ames.
Signalling systems (151)—British Thomson-Houston Company (*General Electric Company*).
Lifting jacks (173)—C. E. Clews.
Shock absorbers for motor vehicles (106)—J. W. Meredith, Thompson Brothers and H. J. Thompson.
Lifting jacks (107)—G. H. Morris.
Wheels for motor vehicles (144)—S. Penney.
Variable speed friction gear (81)—C. A. West.
Friction driving gear (800)—A. Allan and H. J. Davidson.
Change speed gearing for tramcars, etc. (836)—G. Ashton.
Electric welding (877)—British Insulated and Helsby Cables and L. B. Wilson.
Variable speed and differential gear (622)—R. H. Dick.
Brakes for motor vehicles (612)—T. Edwards.
Means for applying sand to tramway rails (767)—L. B. O. Heilbrun.
Automatic control of variable speed gears (587)—F. A. Oddie.
Friction differential for cars (756)—N. Olechnovitch.
Welding apparatus (859)—S. Percival (*David-Bournonville Company*).
Locking device for steering wheels (323)—R. A. Pyke.
Electrodes for electric welding or fusion deposition of metals (549)—Quasi Arc Company and A. P. Strohmenger.
Constant mesh change speed gear for motor vehicles (741)—A. Thompson.
Life guard for motor vehicles (1,369)—C. H. Allen.

SPECIFICATIONS PUBLISHED.

1918.

Audible and visual indicator for use with automobile vehicles (19,667—*135,609*)—E. L. Marley.
Apparatus for use as an indicator of the movements of vehicles and for the regulation of traffic generally (19,992—*135,928*)—J. C. Wells and S. Adams.
Electrically propelled vehicles (20,178—*135,951*)—P. A. H. Mossay.
Rear axle structures for motor road vehicles (21,136—*135,977*)—A. C. Scott.
Trolley heads for electric traction (20,619—*136,260*)—J. B. Parker and J. Smith.
Motor-driven vehicles (20,857—*136,611*)—J. Bamford and C. J. Bamford.
Apparatus for operating the points of tramways and railways (21,065—*136,632*)—H. A. Thomson.
Constant mesh change speed gear (21,259—*136,646*)—J. Ward.

1919.

Wheels for motor road vehicles (548—*135,681*)—J. D. Siddeley.
Self-propelled vehicles (1,004—*135,685*)—Caterpillar Tractors, Limited (*Holt Manufacturing Company*).
Motor vehicles (2,111—*135,698*)—M. Birkigt.
Radiators used for cooling purposes in connection with the power plant on motor cars (3,478—*135,709*)—E. C. Gilbody.
Electric railway systems (14,427—*129,628*)—Metropolitan-Vickers Electrical Company.
Lubricated bearings for axle boxes of rolling stock of railways and tramways (15,345—*135,794*)—G. Eveno.
Detachable flange rim for the wheels of motor vehicles fitted with pneumatic tires (16,266—*135,798*)—L. Johnson and J. T. Roberts.
Temporary axles for motor vehicles (1,045—*136,337*)—P. Lister and J. B. Brown.
Change-speed mechanism (4,031—*136,383*)—A. Boerner.
Petrol tanks for motor vehicles (4,954—*136,396*)—A. H. Edson and R. Youster.
Turning devices for motor road vehicles (5,651—*136,403*)—O. England.
Bearing pedestal for tram trollies (7,408—*136,425*)—T. H. J. Thomas.
Rear axles for motor vehicles (7,803—*136,431*)—G. H. Jones.
Speed indicators (11,024—*136,451*)—R. Berry.
Locking device for the starting handles of motor vehicles (12,536—*136,756*)—H. Dale.
Safety switch mechanism for internal combustion engines of motor vehicles (13,518—*136,759*)—W. J. Wallis.
Spring suspension for motor vehicles (16,244—*136,776*)—G. Fornaca.
Motor vehicles (2,489—*123,080*)—E. H. Belden.
Steering wheels of motor vehicles (4,906—*136,965*)—W. A. Bowen and E. V. Pratt.
Locking means for change speed levers of motor vehicles (6,746—*136,977*)—A. Gay and F. R. Ram.
Steering wheel locking device for motor cars (12,432—*137,000*)—P. G. Peacock.

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TRAFFIC RETURNS.

Tramway and Omnibus Undertakings in the United Kingdom.

NAME OF COMPANY OR CORPORATION.	1919. WEEKS ENDED.					1920. WEEKS ENDED.					AGGREGATE.		
	Jan. 4	Jan. 11	Jan. 18	Jan. 25		Jan. 3	Jan. 10	Jan. 17	Jan. 24		Wks.	1920.	Increase or Decrease.
	£	£	£	£	£	£	£	£	£	£		£	£
Aberdare U.D. Council	615	536	526	526	...	693	581	560	560	...	42	23,574	+ 2,069
Aberdeen Corporation	2,775	2,870	2,552	2,495	...	3,170	3,351	3,008	2,976	...	33½	110,436	+ 21,804
Ayr Corporation	507	418	431	395	...	529	461	456	466	...	36	25,135	+ 4,605
Barrow Corporation	...	...	...	576	...	...	...	...	681	...	3½	2,313	+ 218
Belfast City Tramways	8,900	9,001	9,071	9,050	...	9,901	10,115	10,370	10,546	...	43	442,326	+ 86,477
Birkenhead Corporation	2,137	2,214	2,139	2,088	...	2,953	2,910	3,007	2,966	...	37½	125,128	+ 30,803
Birmingham Corporation	24,363	24,046	24,280	23,970	...	26,282	26,140	26,736	26,896	...	43	1,112,035	+ 91,881
Birmingham Motor 'Buses	1,232	1,271	1,294	1,256	...	1,635	1,593	1,685	1,703	...	43	73,720	+ 11,471
Blackburn Corporation	1,211	1,086	1,181	1,538	...	2,083	2,103	1,954	1,952	...	43½	98,135	+ 21,932
Bradford Corporation	8,710	9,346	9,677	9,051	...	11,328	10,814	11,401	11,186	...	43	488,644	+ 89,788
Burnley Corporation	2,268	2,493	2,662	2,502	...	3,023	2,904	3,204	2,939	...	—	—	—
Burton-on-Trent Corporation	441	434	425	413	...	546	508	527	515	...	43	21,934	+ 4,085
Bury Corporation	2,119	2,020	1,970	1,970	...	2,308	2,134	2,232	2,162	...	42½	100,763	+ 12,769
Chatham and District	899	1,520	1,183	1,228	...	1,162	1,534	1,370	1,442	...	3	4,346	+ 416
Cork Electric	445	679	554	563	...	616	837	763	790	...	3	2,389	+ 227
Derby Corporation	1,488	1,434	1,458	1,445	...	2,061	1,882	1,956	1,936	...	43	83,602	+ 19,040
Dundee City	2,167	2,180	2,011	2,042	...	2,534	2,543	2,362	2,445	...	35½	91,392	+ 21,200
East Ham Corporation	1,703	1,617	1,522	1,530	...	1,822	1,655	1,604	1,646	...	41½	81,591	+ 14,586
Edinburgh Corporation	8,801	9,228	8,856	8,227	...	11,665	11,203	10,886	10,609	...	28½	326,516	+ 57,540
Glasgow Corporation	31,100	28,912	29,002	27,752	...	33,579	31,293	31,845	32,905	...	34	1,097,519	+ 122,298
Glossop (Urban Elec. Supply Co.)	181	210	209	211	...	222	219	229	223	...	4	895	+ 83
Huddersfield Corporation	3,195	3,676	3,739	3,608	...	4,853	4,648	4,747	4,836	...	43	209,259	+ 46,515
Ilford U.D. Council	1,072	1,048	1,022	997	...	1,163	1,120	1,118	1,111	...	42½	50,868	+ 7,794
Ipswich Corporation	720	647	674	658	...	925	772	809	799	...	43	39,673	+ 7,394
Isle of Thanet	412	332	306	313	...	607	477	478	486	...	16½	8,615	+ 3,494
Kilmarnock Corporation	403	293	279	280	...	400	300	300	311	...	36½	10,556	+ 806
Lanarkshire	2,962	5,888	3,587	3,509	...	3,540	5,075	3,658	3,703	...	3	12,436	− 548
Leeds City	13,397	13,917	13,747	13,454	...	16,309	15,397	15,868	16,100	...	43	707,960	+ 129,158
Leicester Corporation	4,971	4,833	4,890	4,839	...	6,148	5,825	6,034	6,026	...	—	—	—
Leyton U.D. Council	2,628	2,540	2,459	2,437	...	2,846	2,678	2,684	2,759	...	43	131,249	+ 32,340
Liverpool Corporation	20,060	20,271	19,882	19,221	...	24,973	25,049	25,623	25,354	...	3½	87,433	+ 18,655
London County Council	69,724	71,071	69,411	69,018	...	65,527	76,469	76,458	78,195	...	42½	3,374,194	+ 567,708
Maidstone Corporation	363	312	276	278	...	411	360	371	358	...	42½	16,543	+ 4,316
Manchester Corporation	25,515	24,121	27,090	26,997	...	29,753	29,308	30,009	30,067	...	43	1,299,753	+ 183,479
Newcastle-on-Tyne Corporation	8,151	8,700	8,418	7,999	...	9,021	8,465	8,970	9,081	...	42	403,657	+ 19,869
Northampton Corporation	1,068	960	...	...	...	1,442	1,220	...	...	...	41	52,178	+ 16,196
Nottingham Corporation	5,961	5,848	5,978	5,966	...	7,125	6,821	7,222	7,340	...	43	306,048	+ 59,525
Oldham Corporation	2,799	3,510	3,573	3,441	...	4,429	4,241	4,511	4,442	...	42	194,447	+ 42,239
Reading Corporation	1,248	1,217	1,310	1,327	...	1,711	1,536	1,672	1,728	...	42½	68,350	+ 12,991
Rotherham Corporation	2,395	1,858	1,984	2,036	...	2,134	2,258	2,168	2,291	...	41½	90,140	− 7,589
St. Helens Corporation	...	...	...	...	...	1,490	1,632	1,601	1,672	...	16	25,210	—
Sheffield Corporation	11,669	12,885	12,939	12,766	...	19,374	18,269	19,444	19,644	...	43½	728,421	+ 148,400
Southampton Corporation	2,385	2,389	2,379	2,339	...	2,411	2,940	3,041	3,072	...	42½	117,116	+ 9,080
Southampton Motor 'Buses	...	...	...	...	...	154	171	173	187	...	25	3,581	—
Southend-on-Sea Corporation	1,295	1,095	1,103	1,109	...	1,308	1,309	1,328	1,393	...	43	89,109	+ 32,206
South Shields Corporation	1,154	1,135	1,105	1,128	...	1,458	1,313	1,371	1,445	...	43	61,294	+ 12,016
Sunderland Corporation	2,558	2,403	2,431	2,332	...	2,872	2,527	2,788	2,708	...	43	122,767	+ 28,727
Swindon Corporation	...	...	308	316	...	...	...	312	317	...	42½	15,415	+ 2,316
Tyneside Tramways and Tramroads	795	991	840	...	...	898	940	888	...	...	2	1,828	− 3
Wallasey Corporation	2,005	1,961	1,932	1,848	...	2,253	2,220	2,261	2,195	...	42½	107,065	+ 26,295
Walsall Corporation	1,312	1,257	1,285	1,265	...	1,643	1,564	1,631	1,622	...	42	64,606	+ 11,169
Walthamstow U.D. Council	1,461	1,381	1,359	1,308	...	1,577	1,604	1,682	1,725	...	43	73,507	+ 11,568
Warrington Corporation	890	841	849	849	...	943	946	935	930	...	42	38,397	+ 5,214
West Ham Corporation	4,892	4,722	4,693	4,561	...	4,308	4,399	5,019	5,303	...	42½	226,533	+ 30,709
Wolverhampton Corporation	1,914	1,734	1,712	1,692	...	2,243	2,198	2,247	2,356	...	42	88,055	+ 15,433

Colonial and Foreign Tramway Traffic Returns.

NAME OF COMPANY.	1919. WEEKS ENDED.					1920. WEEKS ENDED					AGGREGATE.		
	Jan. 4	Jan. 11	Jan. 18	Jan. 25		Jan. 3	Jan. 10	Jan. 17	Jan. 24		Wks.	1920.	Increase or Decrease.
	£	£	£	£	£	£	£	£	£	£		£	£
Anglo-Argentine	68,664	60,067	24,160	54,003	...	80,007	67,695	68,547	68,000	...	3	204,242	+ 66,012
Calcutta Rs.	85,761	87,519	89,457	83,738	...	92,800	95,845	97,925	91,451	...	3½	328,537	+ 27,185
Madras Rs.	...	(2 weeks	42,582	...	...	...	(2 weeks)	48,883	...	...	2	48,883	+ 6,301
Pernambuco	5,734	5,117	5,275	5,146	...	8,646	8,781	8,475	7,591	...	3½	29,788	+ 10,163

Companies issuing Monthly Statements only.

	1918.					1919.	1919.					1920.	Wks.	AGGREGATE.	
	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.		1919-20.	+ or −.
	£	£	£	£	£	£	£	£	£	£	£	£		£	£
Ballarat & Bendigo	2,996	3,430	3,691	3,570	...	...	2,192	3,396	4,176	4,243	...	...	32	27,806	+ 714
Brazilian Trac. Mlrs	9491000	9081000	8052000	7581000	...	...	9734000	9792000	9980000	9796000	...	...	47	103335000	+9,972,000
Brisbane	42,670	35,400	...	...	...	...	42,245	41,970	...	...	...	...	39	346,370	+ 20,516
British Columbia $	544,339	575,476	580,354	612,893	...	...	667,170	684,946	710,405	733,981	...	...	21	3,438,592	+ 711,562
Buenos Ayres L'c'z.	40,006	...	41,843	42,952	50,460	...	45,310	...	49,692	50,635	55,873	...	26	293,577	+ 34,352
Burma	41,855	30,836	34,848	34,408	34,593	...	43,683	43,152	51,898	46,755	43,571	...	21	229,059	+ 52,519
Cape Town	...	...	...	...	...	...	...	...	...	...	...	...	—	—	—
Carthagena	2,729	2,549	2,525	2,988	2,950	3,655	2,991	1,539	1,465	2,549	2,923	4,748	5	4,748	+ 1,093
East India	1 975	1,939	2,044	1,942	2,048	...	2,761	2,831	2,855	2,709	2,916	...	21	14,072	+ 4,119
Kalgoorlie	3,340	...	...	...	...	...	2,876	...	...	...	...	...	34	21,533	− 590
La Plata	4,382	4,999	5,177	5,334	5,792	...	5,729	5,540	6,196	6,240	6,324	...	52	69,804	+ 7,185
Lima	44,720	42,838	...	44,910	...	...	48,923	48,780	...	52,086	...	...	48	531,788	+ 51,653
Manila $	200,000	204,500	214,898	214,292	...	...	193,841	223,048	241,949	247,599	...	...	48	2,320,607	+ 231,136
Monte Video	16,937	29,611	...	...	...	...	34,873	35,552	...	...	...	...	47	404,501	+ 57,428
Para	24,672	23,442	22,442	19,765	23,800	...	24,890	24,386	27,849	25,422	24,412	...	4	24,412	+ 612
Peruvian $	...	...	...	...	1057990	...	...	...	...	...	1310880	...	—	—	—
Port Elizabeth	...	...	...	...	...	...	...	...	...	...	...	...	—	—	—
Rangoon	5,760	6,067	6,566	6,611	6,188	...	6,472	6,812	7,679	7,379	5,717	...	52	79,247	+ 6,397
Toronto $	1070567	1119925	1048478	1071106	...	...	1083741	1124159	1123801	1111177	...	...	48	11,553,436	− 162,745
Winnipeg $	288,974	285,670	295,005	260,601	...	...	353,194	381,248	428,339	423,826	...	...	48	3,836,848	+ 583,985

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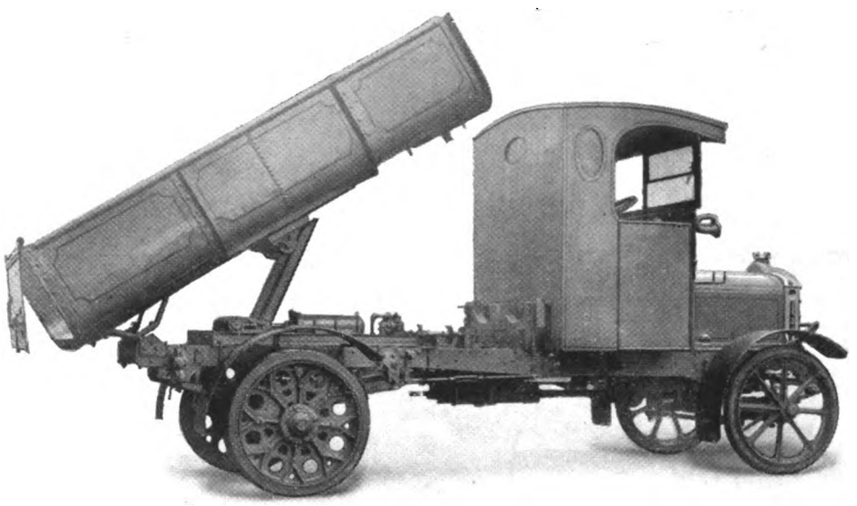

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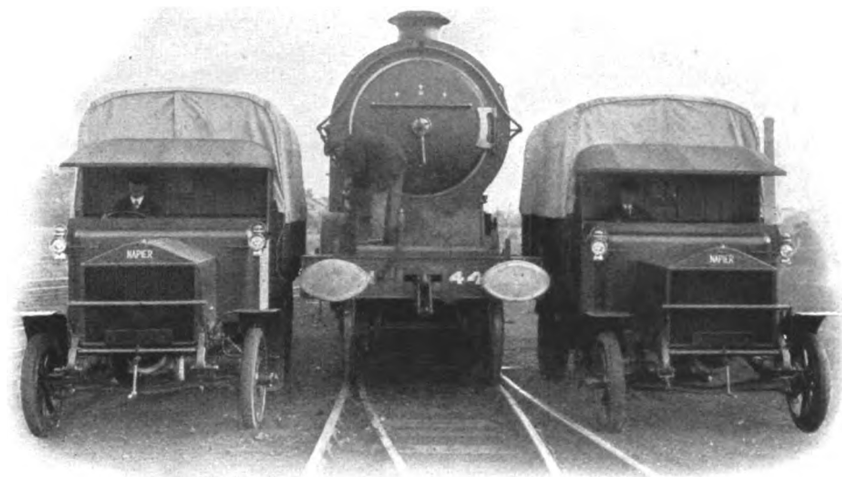

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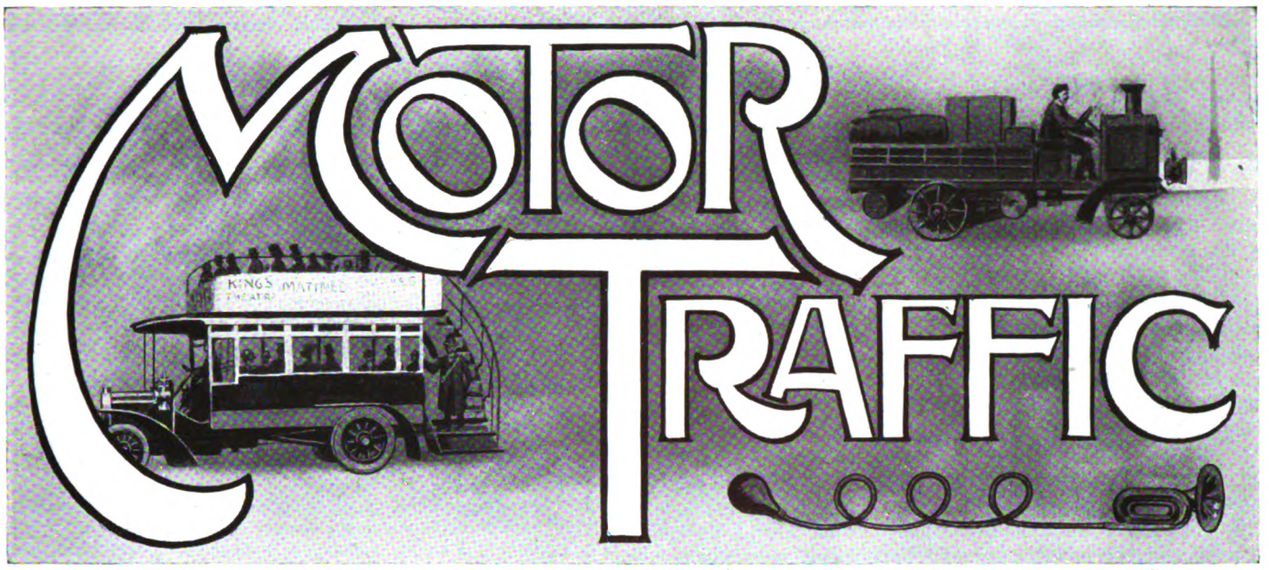

THE NEW TAXATION PROPOSALS.

The main argument for the Government's decision that the petrol tax is no longer workable appears to be that it is becoming possible for a larger and larger percentage of vehicles to dispense with petrol, using either home-produced benzol, which is not taxed; paraffin, which also escapes taxation; or some special apparatus permitting the use of coal gas or producer gas. Thus the revenue likely to be derived from the petrol tax becomes uncertain, and furthermore the officials complain of the cost and difficulty of collection and the ease with which, they say, the tax can at least be partially evaded. We have indicated that the tax on commercial vehicles will probably in future be upon a basis of unladen weight. The actual proposals which are at the time of writing under consideration at the Ministry of Transport, and may probably be adopted definitely by the time these notes appear, can be discussed openly. It is proposed that for commercial vehicles taxation shall be based upon unladen weight taken in conjunction with the probable annual mileage likely to be covered by each class of vehicle. The following scale is, therefore, proposed—

Goods carrying vehicles not exceeding 1 ton, unladen	£16
Exceeding 1 ton and not exceeding 2 tons ...	21
Exceeding 2 tons and not exceeding 3 tons ...	25
Exceeding 3 tons and not exceeding 4 tons ...	28
For 4 tons	30
Tractors	21
Fee for the right to draw a trailer...	5

Road locomotives, £25 to £30, according to weight.

At the time of writing these figures represent proposals and not decisions, but they have been very carefully considered from the point of view of the comparative taxation of the different classes. In each case not only the weight but the probable mileage, having regard to legal restrictions of speed, has been taken into account, the idea being to ensure that in the average case the new taxation will correspond as nearly as possible to the petrol tax. In this, of course, there is the obvious exception of the steam vehicle, which has hitherto not been taxed, but will now have to bear its natural share of the burden. To the proposal that it shall do so, there can hardly be any logical objection. On the average the new tax, if the figures given above are adopted, means an all round increase of about 40 per cent. as compared with the petrol tax. This increase is not a matter of the form of tax adopted. The Government would presumably insist upon it equally if the petrol tax were retained, since the purpose of the tax is the improvement and maintenance of roads, and the cost of all work of this kind has materially increased. Thus one may look at the question from the point of view that, in the old days, the tax paid in respect of a certain motor van enabled a certain number of square yards of road surface to be improved. The cost of labour and of road material has about doubled since the beginning of the war. In that case even a 40 per cent. rise in taxation will reduce the number of square yards which can be kept in proper condition by the contribution from the single motor vehicle. The difference must be made up by the increase in the use of motor vehicles and the fact that, once the roads have been properly renovated from their foundations upwards in accordance with modern knowledge, the cost of maintenance under a given volume of traffic will be reduced. The view is widely held that the proposals as they now stand cannot be regarded as unreasonable, particularly if the burden be eased by permission to pay in quarterly instalments if preferred.

THE CASE OF PUBLIC VEHICLES.

The scale for the public passenger vehicle seems to be more open to serious criticism. Here a different basis is chosen, namely, that of seating capacity, and the Advisory Committee evidently assume that the mileage will be far higher than that of the goods carrying vehicle. It is also assumed that public vehicles operating in London and other big centres of population should pay more than those in less densely populated districts, presumably on the ground that they will carry fuller loads over greater distances. These various assumptions cannot apply very fairly to the coach or char-a-bancs which is often used only for a few months in the year and over a comparatively short mileage. It may, however, be maintained that the char-a-bancs can bear a much higher taxation per mile than the regular service omnibus of equal capacity, because the latter frequently has its fares regulated by the competition of tramways or of tube railways, whereas the former can charge whatever it likes up to the limit that its patrons are prepared to pay for enjoyment. The taxation of a motor cab must not be too high. For one thing, the business will not stand it, and for another an increasing number of vehicles is owned by small proprietors. The mileage covered by the average cab is considerable and, therefore, the suggestion that it should pay from £15 to £18, according to the locality in which it operates, seems reasonable.

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MOTOR TRAFFIC

There are not many vehicles that come into the category of hackney carriages for 6 to 12 passengers, and the figure of £30 to £36 seems to be too high for this class. It does not represent the omnibus plying for hire all day, but rather the hotel or station omnibus covering a small mileage. The third class is for vehicles with a seating capacity of 13 to 18 or, in other words, the small motor wagonette or char-a-bancs. In the main this is a pleasure vehicle, and the fares are not in any sense regulated. Perhaps, therefore, the proposed tax of £40 to £48 may be accepted without much demur. The larger class is the coach or char-a-bancs with seating accommodation for 19 to 24 passengers. This class also includes a certain number of single deck omnibuses. The type of vehicle is not likely to be found in any numbers in the larger centres where it will pay £60 tax. The assessment of £50 is enough, if not too much, for this class when used in other places. Next there is the 25 to 30-seat omnibus or coach, for which the suggestion is £72 in London and £60 in smaller centres. What may be called the full sized double decked omnibuses may be asked to pay £84 in London and £70 elsewhere. Considered in the aggregate, it seems that the whole scale for hackney vehicles is too high as compared with the scale for goods-carrying vehicles. The carriage of passengers at a cheap rate is as important as the economical carriage of goods. Nothing should be done to discourage the organisation by carriers and others of small passenger services, possibly acting as feeders to branch railways. It is improbable that the mileage covered by carriers' vehicles would be any greater than the average mileage of the goods-carrying vehicle of corresponding weight, and yet it is proposed that taxation should be almost three times as heavy. The conclusion is that in arriving at these comparative figures the interests concerned with the carriage of goods have been better or more fully represented than those concerned with passengers, with the possible exception of London omnibus proprietors, whose vehicles cover a very exceptional mileage. Finally, we should like to protest, however futile it may be, against the supercession of the petrol tax by a far less logical and less equitable system.

MUNICIPAL VEHICLES.

From time to time one sees much made of the argument that municipalities ought invariably to prefer electric to any other vehicles on the ground that they can get electricity cheap from their own stations. The point is a good one. Cheap fuel is an excellent thing but it is not everything, and in selecting motor vehicles there are many factors to be considered. There are certainly some classes of municipal work for which the electric vehicle is in every way admirably suited. Outstanding instances are ambulances, which require to be very smooth and silent in motion, easy to control in traffic, cleanly, and free from smell. Then again there are some services that have to be performed at night and as quietly as possible. The radius of action is not great and the limitation of the electric vehicle in this respect is consequently no serious drawback. There are, however, other municipal services for which, owing to one reason or another, either petrol or steam vehicles are particularly suited. The steam tractor is especially adapted to perform certain duties, and the steam lorry, sometimes on metal tires, has special advantages in other spheres. For public service vehicles and for the equipment of fire brigades and some other purposes there is nothing to touch the petrol vehicle. It is, therefore, very unsafe to generalise on the strength of the particular advantage first mentioned. It is nice to be able to sell the produce of one department to another department at a low, but still a profitable, rate. This advantage should be given its full weight, but it ought not to overweigh all other considerations.

A LEYLAND ENTERPRISE.

R.A.F. Machines Purchased for Renovation and Resale.

At the present time, when the demand for motor vehicles of reliable makes with carrying capacity of three tons and upward is so great that delivery in some cases cannot be guaranteed within a year, the news that a large number of Leyland lorries will shortly be available will be welcomed by motor vehicle users in all parts of the country. Much has been written as to the best method of handling the war-worn vehicles left in Government hands at the conclusion of hostilities, but a practical solution of the difficulty has been found by Mr. Harry Spurrier, of Leyland Motors, Limited, in regard to a large number of that company's machines which were lying at the Royal Air Force depot at St. Omer.

Mr. Spurrier has purchased outright the whole of the contents of the depot, including nearly a thousand Leyland machines in varying conditions of repair, together with a large stock of spare parts. As the purchase includes so large a number of machines it is clear that without special arrangements for dealing promptly with them, the difficulties of thorough overhaul and resale would be so great that quick relief of transport congestion would be out of the question. The enterprise of the Leyland Company has, however, surmounted this difficulty, for in conjunction with the purchase of the St. Omer "park" they have acquired the large factory previously belonging to the Sopwith Aviation Company, Limited, at Ham, Richmond, which will enable the reabsorption of War Office machines into civilian service to be made with celerity and under the best possible conditions.

We understand that every machine will be thoroughly overhauled, being stripped to the frame and each part built up again under the strictest supervision, so that when offered for sale the chassis will be as new. The company will give six months' guarantee with all machines which are issued after overhaul, and desire it to be known that the machines carrying this guarantee can only be obtained from the company or its accredited agents.

FUEL RESEARCH BOARD.

Enquiry into Possible Sources of Alcohol.

Owners of motor vehicles have received with satisfaction the official announcement that the Lord President of the Council has appointed Sir Frederic Nathan, K.B.E., late R.A. to be Power Alcohol Investigation Officer under the Fuel Research Board of the Department of Scientific and Industrial Research.

The appointment has been made as a result of the consideration given by the Committee of Council for Scientific and Industrial Research to the report of the Interdepartmental Committee on the Production and Utilisation of Alcohol for Power and Traction Purposes, which recommended the establishment of a small permanent organisation under the Department of Scientific and Industrial Research to continue investigations into these problems. The Fuel Research Board propose to begin by bringing the work already being done both as regards production and utilisation of alcohol into proper focus.

Sir Frederic Nathan, who before the war was superintendent of the Royal Gunpowder Factory at Waltham Abbey, and later works manager of Messrs. Nobel's explosives factory, Ardeer, was the officer in control of alcohol under the Ministry of Munitions during the war and chairman of the Production Section of the Interdepartmental Committee above referred to. He has been entrusted with the survey of the present position and with making proposals to the Board for such experiment and research as may from time to time appear to be necessary. It is obvious that until a more or less accurate estimate has been made of the possible sources for the production of alcohol within the Empire, and until their probable amount and the cost of using them have been ascertained, it would be useless to embark upon research into methods of production or utilisation.

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MOTOR TRAFFIC

Professor Pierce Purcell, who was secretary of the Irish Peat Inquiry Committee, has been appointed to act as Peat Investigation Officer under the Fuel Research Board. His duties will similarly be to keep the Board informed of all progress in connection with research into the utilisation of peat, to continue and extend experiments on the mechanical cutting and winning of peat, and to make arrangements for careful tests of peat as a fuel under boilers.

Alternative Fuels.

An expert on fuel questions interviewed by the *Daily Telegraph* urged that the Government should produce power alcohol in factories overseas, where the raw material is available in immense quantities. The Government, he added, could import it in their tank steamers, and make arrangements for distribution, either through an organisation to be specially developed for that purpose or, perhaps preferably, by way of garages. The Government hold the bulk of the shares in the Anglo-Persian Oil Company; that company in turn control the British Petroleum Company, well known before the war as the distributing organisation for one of the best-known brands of petrol. That organisation is still in existence, and could, if necessary, undertake the distribution of power alcohol.

As a motor fuel alcohol alone is unsuitable for application in engines of the type used for motor cars, but mixed either with benzole or ether alcohol is admirable.

In Natal, for several years past, a spirit called "Natalite" has been employed with great success. It is manufactured from the waste products of the sugar factories, and from these products can be obtained, in whatever proportion is required, alcohol and ether. "Natalite" is composed of about 55 per cent. alcohol and 45 per cent. ether. It has been tried in this country, and no ill-effects whatever were experienced to car engines from its use.

LIVERPOOL'S NEW OMNIBUS.

With Top Cover and Front and Rear Wheel Guards.

We are indebted to Mr. C. W. Mallins, general manager of the Liverpool Corporation Tramways, for the accompanying illustrations of an omnibus of new design, which has been adopted by the Liverpool Corporation. The features of the vehicle which will at once attract attention are a permanent top cover and guards for front and rear wheels, which have been designed by Mr. Mallins. The body is mounted on a chassis manufactured by the Associated Equipment Company, and provides for a 45-h.p. Tylor engine. The lower deck is built mainly of oak, and is fitted with transverse seats to accommodate 26 passengers. There is also accommodation for two passengers in the driver's cabin.

Both in appearance and in weight the cover of the upper deck is very light and chiefly consists of duralumin and glass. The former alloy is a British invention, which was largely used for airship construction, and it is lighter than wood. The windows are allowed to drop sufficiently to provide for good ventilation. The upper deck is extended over the driver's cabin, and is fitted with longitudinal knifeboard type of seats in the centre, accommodating 27 passengers. On the two decks seating is provided for 55 passengers in all.

Patent front and rear wheel lifeguards are fitted. The front guard is carried by forwardly projecting brackets mounted on the front axle. The variations set up to the body springs are eliminated, and a fixed clearance is given between the road and lower edge of the guard, which is so arranged that the wheels are protected at whatever angle they take in the steering of the vehicle. The rear wheels are protected by a similar type of guard fixed to the axle, and so arranged that it can be adjusted to allow for the wear of the tires. These guards are claimed to be more than usually efficient.

New Type of Omnibus with Covered Top-Deck—Liverpool Corporation Tramways.

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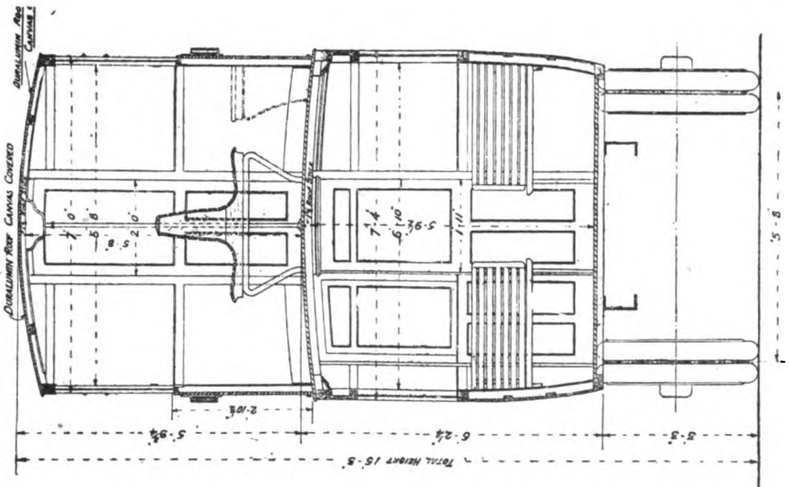
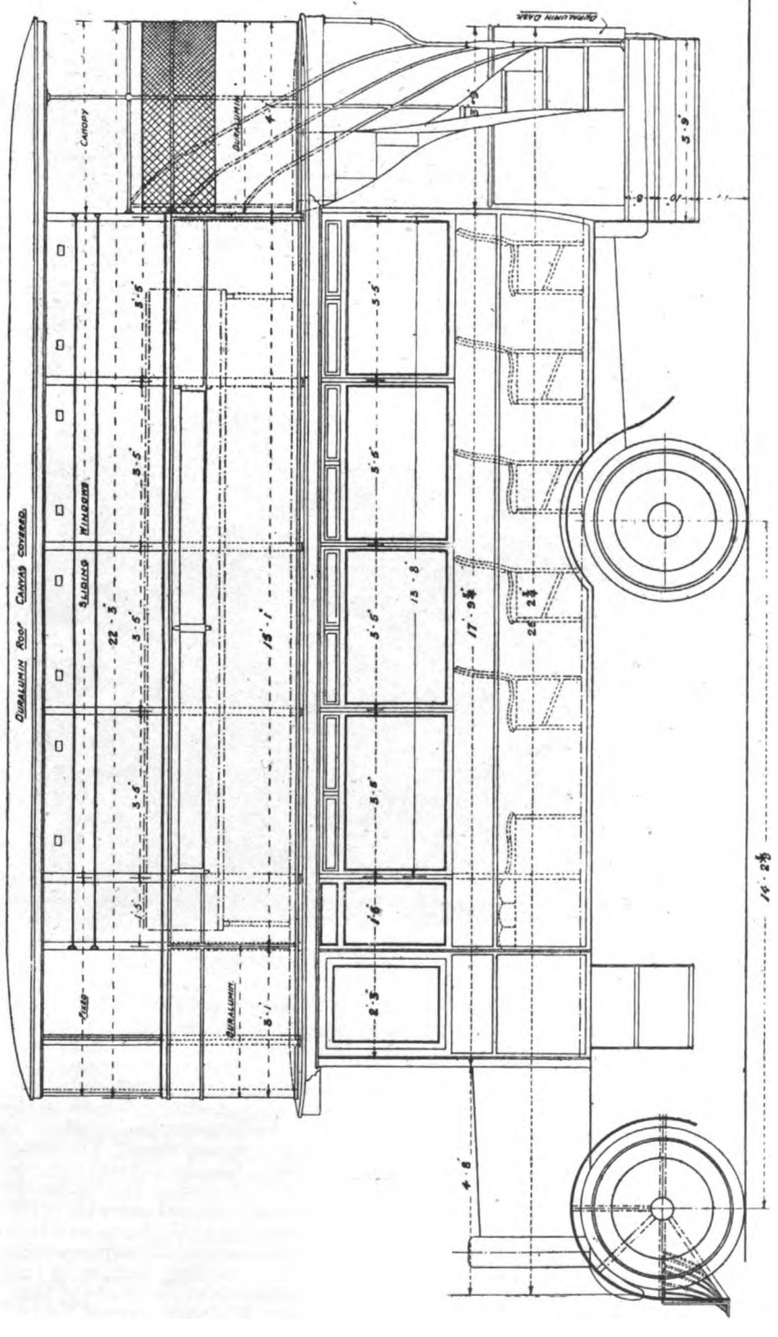


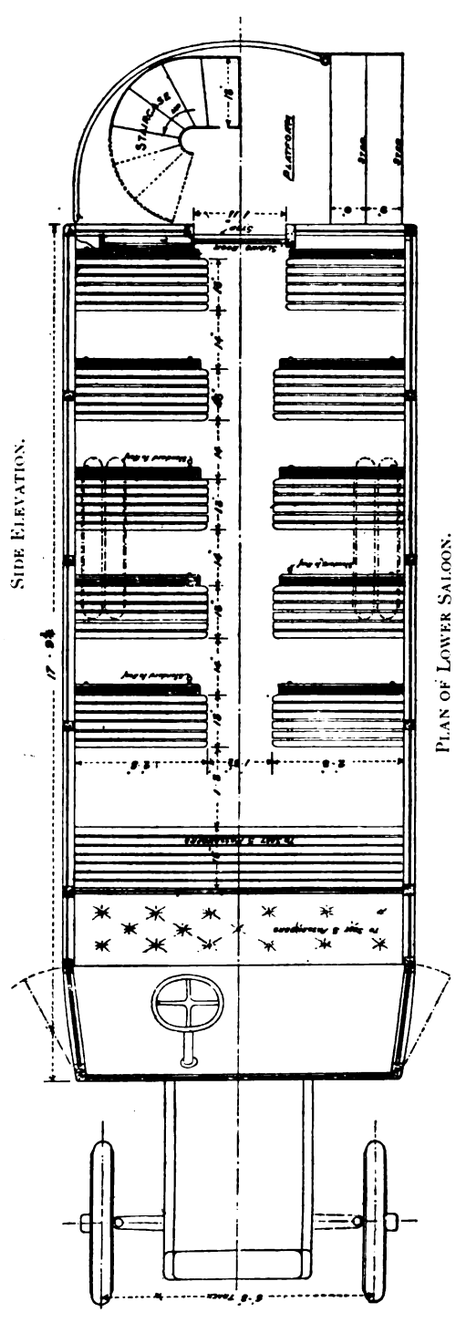
CROSS SECTION.

Seating Capacity.

Lower Saloon	28	passengers.
Upper Saloon	27	"
Total	55	"



SIDE ELEVATION.



PLAN OF LOWER SALOON.

New Type Double-Deck Motor Omnibus with Covered Top—Liverpool Corporation Tramways.

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MOTOR TRAFFIC

THE WITHDRAWAL OF THE LORRY OMNIBUS.

MILITARY MOTOR LORRIES' SERVICES IN LONDON TRAFFIC.

In the end of January the last of the lorry omnibuses disappeared from the streets of London. It was on June 2, 1919, that the lorry omnibus made its first appearance. The omnibus traffic was increasing greatly, and the London General Omnibus Company were quite unable to meet the demands. The difficulties both as to labour and materials were then very great, so that it was not possible to build new vehicles. At the same time, it was only gradually that the great fleet which the company had sent to France for the purposes of the war were being returned. When they did come back they had to undergo repairs and renovation before they could be put into public service. That also took time. At some periods of the war the company had as many as 1,300 omnibuses in France.

In order to try to relieve the congestion and to enable a greater number of would-be passengers to be carried, the company entered into an arrangement with the War Office, under which the latter placed at the disposal of the former a number of military motor lorries. Each vehicle was adapted by having a door and steps provided at the rear and cross seats fitted for passengers. A canvas canopy was erected as a partial protection from the weather A start was made early in June with 56 lorry omnibuses, and the number grew, till in November there were 176. In December the number began to diminish, till now nearly every one has been taken out of service. They have been replaced by the repaired omnibuses which had been in France. At present the company have 600 more omnibuses running than they had a year ago. Congestion is not so bad, but still the number of passengers continues to grow.

In starting the lorry omnibus services the company were doing the best they could for the public but the latter did not take kindly to the experiment. Nor was it surprising. The vibration to the passengers was very severe. The lorries were fitted with springs to carry a load of three tons, and as they were seated for 26 passengers, that meant a load of only about a ton and a half. No standing passengers were allowed. Hence for all practical purposes they were springless omnibuses. Then there was an open space between the canopy and the side of the vehicle, so that passengers might look out and so that some light might get in. This resulted in furious draughts when the vehicle was running. During the summer months the lorry omnibuses were tried on Sundays as well as on weekdays, but they were soon withdrawn on Sundays owing to the poor patronage they received. On weekdays they were well patronised only during the busy hours, because the ordinary omnibuses could not carry all the people desiring to use them.

The omnibus company did not find the lorries a paying proposition. It was soon ascertained that they were being worked at a loss of no less than 5d. per mile run. This arose from various causes. In the first place the eight-hour day for drivers and conductors came into force just before the lorries began running. Thus the vehicles could not cover both the morning and evening rush hours unless two shifts of men were employed. Yet it was only during the rush hours that something like paying loads were obtainable. Then the petrol consumption was very high. When the running began only about 4½ miles to the gallon could be got. As the result of improvements carried out this was increased to 5½ miles, as compared with about 7 miles in the case of the ordinary omnibus. That was attributable partly to the fact that the lorry weighs 4 tons unladen as compared with 3½ tons in the case of the standard omnibus, and partly to the fact that the engine carburetter, etc., were of a less efficient type.

Another disadvantage of the lorry was that owing to its over-all dimensions it occupied more space in the garage than the ordinary omnibus, and for the same reason it was more difficult to negotiate at turnings and when reversing at termini. A further trouble was that there were more boarding and alighting accidents, because the build of the lorries did not lend itself well to the construction of stairways. Finally, the earning, like the carrying, capacity was low. The experiment should convince the public of the earnest desire of the omnibus company to do everything possible to meet their wants, even when the doing of it results in a pecuniary loss.

MORE MOTOR OMNIBUSES FOR EDINBURGH.

The success of the experiment of the Tramway Committee of Edinburgh Town Council in running a service of five motor omnibuses on the Ardmillan Terrace-Abbeyhill route has led the subcommittee to recommend the purchase of thirty new motor omnibuses at an estimated cost of £55,000. Other orders will be placed later. Alterations which will be necessary at Shrubhill depot to accommodate the additional omnibuses will cost £4,200.

G.V.C. ELECTRIC FOR PARCELS.

METROPOLITAN RAILWAY COMPANY'S EXPRESS SERVICE.

For some years the battery vehicle has proved of the greatest utility for the delivery services of several of the leading commercial firms in London, and also for the parcels traffic of the Great Western Railway Company. Owing to their increasing parcels traffic the Metropolitan Railway Company have had to augment their road vehicles, which hitherto have comprised both petrol and horsed vans. The company's choice is the 2-ton battery vehicle manufactured by the General Vehicle Company, Limited, of 43, Shoe Lane, E.C., with works at Birmingham. This machine is illustrated in

G.V.C. Electric for Parcels Service.

the subjoined photograph. It has the 2-ton standard chassis fitted with an ironclad battery 44 I.M.V.7 of the Chloride Electrical Storage Company, Limited. On a single charge the vehicle travels about 45 miles at a speed of 12 miles per hour loaded and 13½ miles per hour unloaded. This chassis is one of the first produced at the G.V.C. Works at Birmingham, and it is the first electric to be used by the Metropolitan Railway Company. For a service which entails frequent stoppages in order to collect and deliver parcels, it promises to be an ideal machine.

CHARGES FOR OMNIBUS TRAFFIC.

Numerous County Councils have decided to impose a charge of 3d. per omnibus-mile for new services, among them being East Suffolk, Derbyshire, Gloucester, Staffordshire, and Somerset. Derbyshire have asked for payment of £75 per vehicle per year in advance.

Other authorities are widely supporting a resolution arrived at by Morecambe Council requesting the Government to introduce legislation to provide for the payment of a fair mileage rate by private omnibus operators.

REIGATE RURAL COUNCIL have decided to waive any rights they possess for charging fees for the use of the roads on the ground that the services of the East Surrey Traction Company would be of great use to the districts concerned.

PLYMOUTH WATCH COMMITTEE have given licences on condition that a payment of 1½d. per omnibus-mile be paid by the proprietors.

ROTHERHAM TRAMWAYS COMMITTEE have agreed to provide an experimental omnibus service for three months to Silverwood Colliery if the Rural Council will waive the mileage charge.

A joint meeting of the Health, Parks and Gardens, and Tramways Committees of Liverpool Corporation was recently called to consider the upkeep of the roadways, many of which are at present in a very unsatisfactory condition. One question is the cutting up of the various thoroughfares by motor omnibuses, and the Tramways Committee have now agreed to contribute towards the maintenance of Gardners' Drive, Newsham Park, which is suffering considerably from these vehicles passing to and from the Old Swan. It was decided to macadamise with an improved system of macadam and tar all those streets now laid with a mixture of macadam and water.

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MOTOR TRAFFIC

MECHANICAL TRANSPORT IN THE WAR.*

The author hopes to show the improvements effected in mechanical transport as the result of war experience, and to point out the directions in which developments may be expected; for notwithstanding the initial efforts made under the War Office subsidy scheme and the four years of operation on service conditions, the ideal heavy vehicle has yet to be evolved.

The vehicles commandeered in 1914 had to be hurried across the Channel and put into service. Heavily overloaded, and only stopping to take in supplies of petrol, water, and oil, the lorries were run until they collapsed.

About thirty different makes found their way to the front during the period in which lorries were impressed, but a gradual weeding out reduced them to sixteen approved makes of British lorry. Theoretically, there can be no argument against a standard vehicle, but first one must be in the possession of data concerning performances under war conditions to decide how such a vehicle is to be designed. Apart from the question of design, it must be remembered that the demand for motor vehicles to supply the army were so very heavy that there was no chance to commence any organisation for what is termed "mass production." The Government offered every possible facility to assist the manufacturers in turning out more lorries; vehicles of the heavy type were built by car manufacturers, and yet the numbers were below requirements. The supply had to be augmented by imports of vehicles from the United States, and with British and American vehicles operated side by side engineers at the front collected interesting comparative data.

Mobile Warfare.—During the first few months of the war, the transport conditions bore some slight resemblance to those which had been anticipated by the authorities responsible for the organisation of the mechanical transport section. For a time, the original scheme appeared to answer fairly well, except that when repairs were needed the workshop was difficult to locate. This was accounted for by the fact that steam tractors were used to haul the workshops, and could not keep up with the faster petrol-driven vehicles. These unwieldy contrivances were captured by the Germans and replaced by mobile shops mounted on petrol-driven chassis.

During the mobile warfare period, all the transport was working under more or less ideal conditions. The only drawback from a mechanical point of view was that drivers laboured under the impression that in the course of a few weeks' time their vehicles would be worn out, and they neglected to perform the minor repairs and adjustments. The workshop officer was looked upon as a useless invention.

Stationary Tactics.—Following the period just referred to came one in which transport conditions underwent a complete change. Supply dumps were established within easy reach of the front, and the transport units were seldom moved except for short distances. One would expect that full advantage would be taken of the turn of events to carefully overhaul all vehicles suffering from neglect. But the workshop officer was kept in the background, where he was left to write out demands for spare parts, which at the time were not available. Any suggestion as to the advisability of executing repairs to make the vehicles fit for further duty was turned down.

The Mechanical Period.—After the transport had remained stationary, or practically so, for nearly twelve months, impending changes of military tactics gave rise to a feeling of anxiety regarding the condition of the transport vehicles.

The first step was to give the workshop officer an opportunity of effecting minor repairs and to provide facilities for the supply of such spare parts as were to be had from the base stores. Recognising that nearly all the vehicles were in equal need of repair, the Director of Transport stipulated that only a certain percentage from each unit should be taken out of service at any given time. Pamphlets and circulars were issued broadcast giving instructions as to the best methods of handling repair work, and amongst other information distributed in this way were lists showing possible causes of breakdowns of various makes of lorries and general information concerning upkeep and maintenance. In contrast with their previous attitude the authorities invited suggestions as to the most suitable means for obviating some of the difficulties resulting from the continued neglect of repairs. Considerable time and trouble was spent in working out improvements to standard makes of vehicles to ensure that they would give the best results under the strenuous conditions anticipated.

Manufacturers of lorries were given the opportunity of inspecting their makes of vehicles on active service, and in doing so they not only helped the War Department by making numerous improvements, but collected information which will doubtless prove of great value in perfecting future designs. About this time, the Director or Transport organised a special service known as the M.T. Inspection Unit, composed of officers selected as experts on automobile engineering. They were responsible for carrying out detailed mechanical inspections of all vehicles, and assisted any workshop officer who desired technical advice. By means of reports forwarded by the inspecting officers to general headquarters, the Director of Transport was able to decide the suitability of any given M.T. unit to take part in required tactics. Those officers who, being motor engineers, were engaged upon inspection duties at the front, had extraordinary opportunities of enlarging their technical experience, and if the sum total of the experience thus gained could be collected and put within reach of automobile designers, startling improvements would result.

The Triumph of Transport.—Trials and difficulties existing towards the end of the campaign surpassed anything that had been experienced before. All the vehicles were becoming badly worn, spare parts were increasingly difficult to obtain, drivers enlisted in the later categories had not the vaguest notions of handling any kind of motor lorry, and the distances comprising the daily runs from the dumps to the distribution points were greater than at any previous phase. Every section of the mechanical transport, including organisation, material, and *personnel*, was tried to the utmost limits, and the way in which the whole responded to the call helped in no small degree in defeating the Hun. The superiority of the Allies only definitely asserted itself when their methods of transport surpassed those of the enemy.

Active Service Conditions.

The most surprising feature about the use of motor vehicles at the front is that they were kept running at all under such adverse conditions. It may be of interest to review some of the difficulties which were encountered.

Difficulties of Production.—In the early days of the war the *personnel* of almost every motor factory was seriously reduced by the voluntary enlistment. Many factories eminently suitable for the production of motor vehicles were taken by the Ministry of Munitions for other work, and for a long time the question of providing adequate numbers of transport vehicles was left to look after itself. Following the serious depletion of *personnel*, manufacturers were faced with an even more baffling difficulty, namely, the shortage of raw material for the construction of lorries. Metals of all descriptions were required for shell making, the production of aero engines and other forms of munitions.

Bad Storage Facilities.—Having emerged from the factory ready for work, the vehicles enjoyed a rest at one of the depots scattered about the country. Owing to the inadequate storage arrangements and neglect, an enormous amount of work had to be done to each vehicle as it arrived in France. The deterioration commencing at the depot was not infrequently hastened by the manner in which the lorries were shipped. The action of the salt water upon various parts unprotected by any form of packing case caused a great deal of trouble.

Skilled Drivers and Drivers.—Later on the lack of efficient men to handle the vehicles constituted a serious difficulty. The shortage became so serious that schools of motor driving were instituted by the Government. Expensive vehicles had to be entrusted to men who had not the vaguest idea of manipulating the change speed mechanism. In consequence, the staffs of the mobile workshops were continually occupied in attending to trivial repairs. By studying the trivial defects which baffled the inexperienced driver at the front, designers may be able to modify certain details with the object of rendering subsequent models more fool-proof.

Road Conditions in Battle Areas.—The principal trouble arising from the road conditions was commonly described by the lorry drivers as "getting ditched," which happened so frequently that special lorries had to be equipped for extracting vehicles from the ditches. During the wettest of the winter months, drivers experienced the greatest difficulty in steering the lorries back on to the *pavé* once the wheels had become embedded in the mud after giving way to a staff car, and then the heavily loaded vehicles would slide sideways and turn over in the ditch.

Traffic conditions were further complicated by trains of horse and mule transport, which frequently lined one or both sides of the roads for miles. The state of affairs commonly occurring on the roads leading to the front line was beyond description. When one considers that at least one lorry was ditched out of every large M.T. convoy each night during the winter and that hundreds of convoys were engaged at the same time upon supplies and ammunition, it is easy to conceive how the art of "unditching" lorries developed by leaps and bounds. A great deal of mechanical trouble was caused

* From a paper read by Capt. Richard Twelvetrees, R.A.S.C., M.S.E., A.M.I.Mech.E., M.Soc.Ing.Civ. (France), at a meeting of the Society of Engineers, December 1, 1919.

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MOTOR TRAFFIC

by the bad road surfaces. The continual vibration set up by the speed at which lorries had to be driven over the cobbles or *pavé* had the effect of crystallising the metal of unsprung portions of the mechanism and caused innumerable bolts and nuts to work loose with alarming results. A large percentage of the work done in the mobile workshops comprised repairs and renewals to parts which had worked loose by vibration and had been neglected by drivers. Roads became so badly disintegrated by excessive traffic as to render ordinary repairs to the surface quite out of the question. In such cases the traffic had to be carried on corduroy roads built of rough hewn pieces of timber, held together by stout wires. It was no easy matter to manœuvre a heavily loaded lorry over such a surface, especially as the ground beneath was of the most spongy character.

The Work of an M.T. Formation.—Describing the work of 30 3-ton lorries and six caterpillar tractors with a siege battery ammunition column, the author said the gun shifting operations were very dangerous, and the unwritten records of the R.A.S.C. are full of brave deeds performed by tractor drivers, who by handling their unwieldy charges under heavy shell fire and in the dead of night made it possible for their comrades in line regiments to go "over the top" properly protected by a well directed barrage. The period of waiting for the arrival of the ammunition train was occupied in making minor adjustments to the lorries, and the short rest preparatory to the night trip to the gun position provided the only chance of effecting minor repairs necessary to keep the lorries in running order. The whole of the columns were often worked so hard that none of the vehicles saw the inside of a large repair shop from one year's end to another. It was during the night journeys up to the line that men and vehicles suffered most. The road conditions lent themselves to the "ditching" already mentioned, and the prohibition of all lights added to the difficulties of driving. During the daylight every precaution was taken to ensure that the road was sufficiently free from shell holes to permit of the passage of a convoy in the following night, but sometimes in the interval a few well-directed hits would make holes in the road of such a size that a vehicle would tumble completely in. Accidents of this kind often delayed entire convoys of ammunition as well as supplies, so that the traffic congestion became very serious.

Lessons Taught by the War.

After a vehicle had been subjected to such unusually severe treatment for a period of twelve months or more, one can understand that subsequent examination of the dismantled components revealed many interesting points upon the subjects of design and construction, some of which will now be considered in detail.

Improvements in Design.—Many vehicles operated at home under normal conditions with a fair measure of success proved weak in many respects. Types previously regarded as amongst the best often failed in competition with others less widely known. Irrespective of general design, that is to say, of the grouping of the various components, motor vehicles of the heavy type may be considered in three classes. *First* there is the lorry evolved from the light car. This kind usually runs smoothly, and in ordinary circumstances gives low running costs. *Second* is the machine built for load carrying alone, and the design of which necessitates a break from nearly all the features common to the pleasure car, and lastly there is what may be described as a composite lorry, consisting of a collection of components made by various manufacturers and assembled in a frame by the firm who market the product. The composite lorries of British manufacture are not so satisfactory as either of the two other types, though during the war many were built to keep up with the huge demands.

Frames.—One of the most common troubles experienced with war worn lorries consisted of broken or damaged frames. Designers who, being used to touring car work, suddenly turned their attention to heavy vehicles, had a decided preference for the pressed steel channel frame. This type of frame when subjected to heavy and continuous loads is apt to suffer from permanent deflection. The riveted joints between the different members of the frame work loose rapidly, and fractures of the main members are of frequent occurrence. The frame which gave the best results under active service conditions was built up of two rolled steel channels braced transversely by members of heavy gauge drawn steel tube, secured to the main members by stiff bolted brackets.

Advocates of the pressed steel frame contend that by allowing a certain resiliency in the frame, other components are protected from vibration. The author is of the opinion that for heavy vehicles the frame should be as rigid as possible, and that any resilience between the frame and such parts as the engine and gear box should be allowed for in the design of the suspension of these components. The ideal heavy duty vehicle should consist of a strong frame to bear, without any deflections, the maximum load for which the vehicle is designed, and an engine and transmission mechanism able to do its work unhindered by road shocks. The importance of the latter point is borne out when one recollects that several designers utilise the engine and gear box as members to brace the frame in a transverse direction. Frames should be free from unnecessary curves in the main members and sufficiently narrow to allow of a full movement of the front wheels in both directions for steering, and should be capable of providing good support for the chassis components, without any sub-framework.

Engine Details.—The engine power developed by the average military lorry was high enough to meet all demands, which proves that the volume of the cylinders was proportionate to the load carried by the lorry, but many makes cost a lot to repair owing to excessive wear upon crank shafts and their bearings. This is one of the results of attempting to follow light car practice, for in attempting to turn out a neat "high efficiency" engine the bearing areas have been unduly restricted in order to keep the whole engine within certain dimensions, which in heavy vehicle design is of secondary consideration. Large numbers of expensive cylinder castings were scrapped owing to the failure of a small set screw securing the piston gudgeon pin. On several different makes of lorry engine the gudgeon pin was apt to work sideways in the piston and score deep grooves in the cylinder walls, damaging the latter beyond repair. Although much of the wear due to insufficient lubrication may be put down to negligence of the drivers, many of the lubrication systems are open to improvement.

Clutches.—Notwithstanding improvemnets made in the design of friction clutches during recent years, the old fashioned external cone clutch gave the best results. The only improvement in this pattern of clutch is the substitution of a special wear-resisting asbestos fabric in place of leather, which is apt to become brittle owing to friction. Many lorries were fitted with multiple disc clutches, but gave no improved results in operation to justify the additional expense and complication.

Universal Joints.—The net result of so-called improvements is that each joint possesses numerous parts, all of which are more or less subject to wear, so that when a vehicle has to be overhauled the cost of replacement is very heavy. The trend of modern design is to employ laminated fabric discs connected by coupling arms to the driving and driven shafts respectively, thus obviating metallic wearing parts and providing at the same time a perfectly flexible joint between the two shafts.

Gear Boxes.—Although the sliding gear system of changing speed has been regarded as an affront to engineering, the gear box has given less trouble than other main components of the chassis. The reason apparently lies in the fact that, recognising the chances of damage, the designers of sliding type gear boxes have allowed wide margins of safety, and with improved qualities of steel and the development of scientific treatment during the hardening processes, what has always been considered as a weak point in automobile design has become one of the most reliable .

Final Drive.—For heavy vehicle work, the chain drive still holds its own with the worm drive and double reduction gearing for back axles.

The author is of the opinion that the heavy vehicle will have to undergo much modification of detail, especially to eliminate defects developing as the result of war work, and further to avoid complicated designs that would hinder the rapid production so necessary to enable manufacturers to compete with the increasing imports from America and the Continent.

Reply to Discussion—Post-War Lorry Design.

In the course of his reply to the discussion, Capt. Twelvetrees said bevel drive was superseding the worm for light cars, but lorry makers generally were rather behind car makers. It was possible that they would either adopt the bevel or, more likely still, the double reduction gear as in the subsidy lorry. The future for heavy traffic, he believed, would lie with the chain; but for some reason the chain was not popular with the public.

Mr. Holroyd Smith had endorsed the views expressed upon frame resilience; Mr. Smith was an expert on steel and constructional steel matters. The same gentleman referred to collating the experience obtained through the technical services in the army. That he believed, was being done by the army authorities. He believed that a committee had been formed with the object of designing a post-war lorry.

Mr. Wilson had asked about breakages due to differences in the quality of the steel. Unfortunately at the time those concerned had no methods of identifying the specifications of steel used. The breakages, as a rule, were caused by one or two things. The first was the crystallising resulting from vibration. Lorries suffered very much through running on tires that were worn out. Nearly all the cases of fracture were due to that crystallising action with which

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MOTOR TRAFFIC

engineers were familiar. The other breakages were due to imperfections in design. Prior to the war, the lorries were used for industrial purposes, where the stresses were much lower, and the diameters of shafts and the section of gears were proportioned in such a way as to render them unsuitable for transmitting the severe stresses met with on active service.

In the opinion of the author, the most suitable type of drive for heavy vehicles consists of employing side chains, as generally speaking that mechanism involved fewer working parts than either of the other types mentioned. One of the principal objections to the double reduction axle was that the weight of the gearing had to be supported by the axle itself, and this weight being undersprung had the effect of creating rapid wear of tires. One noticeable feature, demonstrating the relative values of double reduction and chain drive, was shown by the fact that certain types of wheel, while standing up satisfactorily on chain driven axles, collapse when applied to double reduction or worm gear axles. In discussing the merits and demerits of types, the question of replacements must be considered, and for military or industrial purposes the most successful vehicle to operate was that in which the wear parts were reduced to the lowest margin. A census of the recent automobile show revealed that the worm drive axle is losing its popularity in favour of the helical type of bevel bearing. In the experience of the author, the engines fitted to lorries used at the front do not possess an unnecessary amount of power, because under certain conditions an ample reserve was essential. The only trouble with regard to engine power consisted in the employment of governors which could easily be tampered with, so that when the vehicles were empty, the drivers indulged in excessively high speeds, which wrought havoc with the chassis.

Tired drivers had been mentioned. It was a physical impossibility for the drivers to keep awake. On many occasions lorries ran off the road because the drivers fell asleep.

THE INSTITUTE OF AUTOMOBILE ENGINEERS.

At a meeting on January 7, the premium awarded by the Daimler Company for the best paper read by a graduate during the session 1918-19, was presented to Mr. L. Griffiths for his paper on "High Tension Magnetos." The Crompton medal for the session has been awarded to Mr. A. E. Merriman for his paper on "An Analysis of the Test Records of Some Petrol Engines."

The final details of the examination for admission to the Institution have now been settled, and the syllabus has been published. The first examination will be held on February 27 in London, Birmingham, Coventry, Sheffield, Liverpool, Glasgow, and Bristol.

Owing to pressure of business, Mr. Sidney Straker has resigned from the Council, and the vacancy thus caused has been filled by the co-optation of Major Charles Wheeler.

It has been provisionally arranged that the summer meeting of 1920 shall be held from June 21 to 25, when visits will be made to the Midland Railway works and the Rolls-Royce works at Derby.

DEMANDS FOR AUSTIN PRODUCTS.

At a meeting of the Austin Motor Company, held for the purpose of sanctioning an increase of capital, the chairman stated that it would be necessary to produce a value in 1920 of cars, lorries, tractors, electric equipment, aeroplanes, etc., of over £10,000,000 to even approximately satisfy the demands of their agents and customers. That was well within the capacity of their works, provided they had sufficient working capital and were able to proceed at once. A branch of the company established in Belgium had had a very successful season.

RISE IN THE PRICE OF BENZOLE.

On January 25 the National Benzole Company, Limited, announced that, owing to the increased cost of production and transport, the price will be raised as from January 26 by 4d. per gallon, that is, from 2s. 9d. to 3s. 1d. per gallon in tins in England, with an additional 1d. as at present in Scotland. There is a reduction of 1d. per gallon if purchased in 50-gallon drums.

INCREASED PRICE OF PETROL.—Great dissatisfaction has been created among users of motor vehicles by the raising of the price of petrol from 3s. 0½d. to 3s. 8½d. per gallon. The Automobile Association considers that the future of motor transport will depend upon power alcohol, and the Association urges that the Government should make the distribution its monopoly.

REVIVAL OF THE SCOTTISH SHOW.

FORTY-ONE EXHIBITORS OF COMMERCIAL VEHICLES.

The chief feature of the eighteenth exhibition organised by the Scottish Motor Traders' Association was the large number of commercial vehicle exhibitors. The show was held in Kelvin Hall, Glasgow, this being the second time that it has taken place outside of Edinburgh. No buildings but the Kelvin would have been spacious enough to have accommodated the extensive display which attracted so many visitors in the week beginning January 23.

The Scottish makers represented were the Albion, Beardmore, Belhaven, Caledon, Carlaw and Sons, Halley, and Mackay and Jardine firms. Sir Wm. Beardmore and Company are newcomers to the industry, showing a 22 H.P. chassis suitable for cab and commercial work. The cab is to be introduced to London. Early in last year the London Owner-Drivers' Association were in negotiation with Beardmore's for an omnibus to be run in the Metropolis, but the scheme has not yet taken effect.

Other commercial exhibits were shown by the Associated Equipment Company, Alldays (by Rossleigh, Limited), Austin (Carlaw and Son), Berleit, Belsize, Bethlehem, Caledon, Commer (by General Motors, Glasgow), Crossley Dodge (Rossleigh, Limited), Daimler Delahaye, Dennis Brothers, Federal, Fiat (Hendry and Company), Garford (Western Motor Company), G.M.C. (Bryson Brothers), Guy (Claud Hamilton, Limited), Halley Industrial Motors, International (Scottish Motor Traction Company), Karrier (Western Motor Company), Lacre (Scottish Motor Traction Company), Leyland Motors, Limited, Maudslay Motor Company, Maxwell (Robert Anderson), D. Napier and Son, Limited, Oldsmobile (General Motors, Limited), Seldon (Scottish Motor Traction Company), Stewart (H. Prosser), Straker-Squire, Limited, John I. Thornycroft and Company, Limited, Tilling-Stevens, Limited, Traffic (J. Laidlaw), Wilson (J. Laidlaw), Vulcan Motor Company, W. and G. du Cros, Watson (H. Prosser), and Wilson.

In addition to British vehicles, the exhibits comprised American, French, and Italian commercial machines, the whole making the most comprehensive exhibition ever held north of the Border. Nearly every exhibit bore a purchaser's label, and dealings were decidedly brisk. Chars-a-bancs and omnibuses were prominently in evidence, but lorries and wagons, of course, predominated. The Albion chars-a-banc was for 27 passengers, and an interesting addition to their wagons was a model of the 3-ton subsidy type, of which 6,000 were made for the Government during the war. Interest in the Daimler exhibits was increased by a sectional model showing the operation of the sleeve valves and the regulation of lubrication of the Daimler engine. Halley's Industrial Motors, Limited, had a chars-a-banc body and a lorry body on their new 35 H.P. chassis with the six-cylinder engine. A third chassis was bare in order to show the simplicity of working and accessibility. Leyland Motors' exhibits included the sixteenth 40 H.P. machine supplied to Edinburgh Corporation Tramways, it having a 28-seat chars-a-banc body. A subsidy lorry exhibit had been ordered by the Clyde Shipping Company, the demand being very great. Attention was attracted by the 2-ton Napier business vehicle with detachable sides, rendering it capable of use as a wagon or a lorry. The 3-5 ton Straker-Squire chassis of 50-60 H.P. bore a 38-seat omnibus body in one deck. This is a demonstration vehicle, and it has traversed 25,000 miles. Londonderry Corporation had purchased a 29-seat omnibus shown by Tilling-Stevens, Limited. It had a very light-looking body, which was in keeping with the ease of working of the petrol-electric engine. This firm also showed the 2½-ton gear-driven chassis, with wagon body, which, together with a 4-ton gear-driven chassis, they now manufacture. A 32-seat single-deck omnibus by J. I. Thornycroft, Limited, was made for the Great North of Scotland Railway, the attractive body being by the Scottish Motor Traction Company. As is general now the seating is of the transverse description, with spring steel back stays. For the driver there is a separate compartment. By the Maudslay Motor Company a 4-ton tipping wagon and a 3-ton lorry were shown, the former with double reduction drive and the latter with worm transmission. Each had the four-speed gear box and the special features of the Maudslay engine which produce economical running.

Tires were staged by the Avon India Rubber Company, Dunlop Rubber Company, B. F. Goodrich Company, North British Rubber Company, Spencer Moulton and Company, Shrewsbury and Challiner Tyre Company, Wood-Milne, Limited, and others.

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MOTOR TRAFFIC

MOTOR VEHICLES FOR MUNICIPALITIES.

RETFORD COUNCIL propose to purchase a fire engine.

PETERHEAD COUNCIL have agreed to obtain a steam wagon.

SWANSEA HEALTH COMMITTEE have purchased a Daimler ambulance.

CARLISLE COUNCIL have ordered a road sweeping machine at £1,500.

SWANSEA CORPORATION have purchased a 25-H.P. Lacre petrol lorry.

STOCKTON CORPORATION have ordered an electric wagon for refuse collection.

EAST HAM WORKS COMMITTEE are considering the purchase of motor road sweepers.

BROADSTAIRS COUNCIL have applied to borrow £1,800 for the purchase of a fire engine.

THE METROPOLITAN ASYLUMS BOARD have purchased an Austin Agricultural Tractor at £300.

BURY JOINT HOSPITAL BOARD are getting a loan of £950 for the purchase of a motor ambulance.

BURTON-ON-TRENT have directed the surveyor to purchase a mechanical sweeper and loader.

NEWTON-IN-MAKERFIELD URBAN COUNCIL require a loan for the purchase of a motor fire engine.

EDINBURGH CORPORATION are seeking competitive tenders for the supply of a petrol fire escape.

ROTHERHAM CORPORATION require a loan for purchasing four petrol lorries and a petrol road roller.

STAFFORDSHIRE COUNTY COUNCIL have obtained three additional 5-ton steam wagons from the Road Board.

WESTON-SUPER-MARE COUNCIL are applying to raise a loan of £1,980 for the purchase of a motor fire engine.

EDMONTON URBAN COUNCIL are asking for permission to get a loan of £6,500 for a fire station and motor fire appliances.

BATLEY COUNCIL are purchasing a road sweeper at a cost of £577, with which it is hoped to effect a saving of £10 per week.

DENBIGHSHIRE COUNTY COUNCIL have been recommended by the Eastern Main Roads Committee to obtain a Foden steam wagon.

SWANSEA CORPORATION have applied for a loan for the purchase of six steam wagons and three trailers for the highways department.

GLASGOW HEALTH COMMITTEE have purchased from Messrs. James Laidlaw and Sons a lorry with detachable capes for £663 10s.

BRADFORD ELECTRICITY COMMITTEE have purchased a Crossley landaulette from the Surplus Government Property Disposal Board.

STRETFORD URBAN COUNCIL have directed the Health Committee to consider the advisability of purchasing a motor wagon for refuse removal.

SWANSEA CORPORATION are seeking permission to raise a loan of £2,000 for the purchase of a motor fire engine and a motor car for police purposes.

KEYNSHAM RURAL DISTRICT COUNCIL have agreed to provide the surveyor with a motor cycle and side car to enable him to get about the district more expeditiously.

GLASGOW CORPORATION have agreed that the senior magistrate be allowed, when necessary for the discharge of his duties, the use of a motor car from the corporation garage.

DURHAM COUNTY SURVEYOR reports that he is arranging to inspect six Foden steam wagons which the Disposal Board has reserved for the County Council at prices ranging from £500 to £550.

POPLAR BOROUGH COUNCIL have ordered two detachable 1,000-gallon watering tanks, with flushing valves and sprinklers, from Messrs. Clayton and Shuttleworth for use with motor vans for street watering.

THE MINISTRY OF HEALTH have authorised South Shields Council to borrow £2,893 for the purchase of two Foden steam wagons, one electric tipping wagon, and one petrol motor road roller. The loan period has been fixed at seven years.

LONDON COUNTY COUNCIL have ordered three chassis at £900 each from Crossley Motors, Limited, for use in the accidents ambulance service. The makes at present in use are Dennis and Armstrong-Whitworth, which were purchased in 1914-15.

CLAYTON AND SHUTTLEWORTH, LIMITED, of Lincoln, have received orders for four 5-ton end-tipping steam wagons from the North Riding County Council, and one each from Chesterfield Rural Council, Eston Urban Council, West Hartlepool Corporation, and Westmorland County Council.

HULL WORKS COMMITTEE have been recommended by the City Engineer to purchase a Sentinel 6-ton wagon, and to advertise for tenders for supplying two or three petrol 3½-ton vehicles. The engineer is to inspect a 4-wheel drive petrol wagon of which a large number are on the market, having been made for the War Office and not having been used.

CHELMSFORD COUNCIL have directed the borough engineer and gas engineer to submit a report showing what alterations, if any, might be made in the present system of carting materials and refuse by substituting mechanical for horse-drawn vehicles so as to reduce the cost thereof. The Council have agreed to pay £3 for the hire of a steam tractor and truck, with driver and mate, when required.

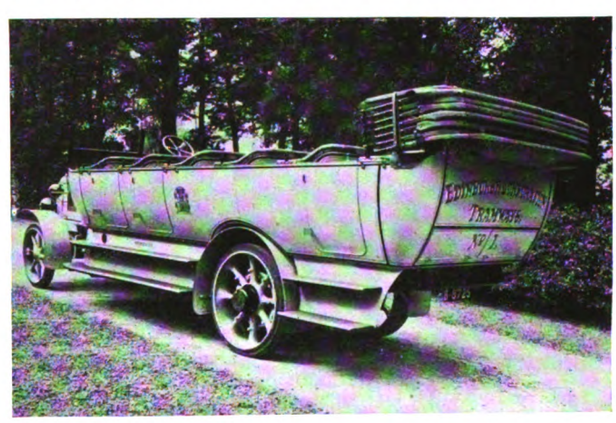
MARYLEBONE HIGHWAYS COMMITTEE have prepared a scheme for wholly carrying out the removal and disposal of house refuse by direct labour. This involves the purchase of more motor vehicles. At present the Council has ten Austin motors, and having considered tenders for both petrol and electric motor chassis, the committee recommend the purchase of seven 2 to 3-ton Austin chassis at £5,250.

SOUTH SHIELDS BOROUGH ENGINEER has reported that he and the chairman of the Works Committee, whilst in London, saw the Edison Company with regard to the electric van, and, although they were within a week or two of the expiration of the guarantee, they had arranged to deduct 25 per cent. from the actual cost of cells for the installation of a new battery. The Corporation accepted the company's offer on the terms mentioned.

LONDON COUNTY COUNCIL have invited tenders from selected firms for supplying seven 5-ton steam wagons, seven light motor trade vehicles, one 2-ton petrol lorry, nine 3/4-ton petrol lorries, two 5-ton cable trailers, two steam or petrol tank wagons, two motors for the tramways traffic manager and the electrical engineer. The heavy vehicles are for use in connection with cartage and other work of the tramways department, and the Highways Committee estimate that by their use the department will save £6,200 per annum. Hitherto £22,500 per year has been spent on hired motor and horsed vehicles, apart from the cost of the removal of sludge and refuse. The cost of acquiring motors, as set forth above, is put at £27,600.

EDINBURGH'S CHARS-A-BANCS AND OMNIBUSES.

A new departure in municipal tramway enterprise has to be credited to the Edinburgh Corporation Tramways Department. Three 27-seated chars-a-bancs of the Leyland Motors, Limited's "De Luxe" type have been obtained, and will be utilised this year for the pleasure traffic for which the district around the Scottish capital offers such an excellent opening. These vehicles have during the past few years proved a first-class investment for private owners and also for tramway companies in the North of England, notably in Lancashire, and it is safe to say that before long the Edinburgh Tramways Department will have to add to their stock of these



Leyland "De Luxe" Char-a-Bancs for Edinburgh Tramways.

machines. That this type of char-a-bancs is worthy of the title of "De Luxe" will be gathered from the appended illustration. The coachwork is finished in grey, the name of the department being shown at the rear and the Corporation's elaborate coat of arms on the side.

Leyland Motors, Limited, are also executing an order given by Edinburgh Corporation Tramways for twelve of their well-known single deck omnibuses, which are to be used for the purpose of augmenting the tramway services during the work of electrification. They will also be available for testing the new routes upon which it is proposed to construct tramways.

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MOTOR TRAFFIC

MOTOR TRAFFIC NOTES.

LONDON OMNIBUS EXTENSION.—Berkhamsted Urban Council have agreed to support a proposal of the L.G.O.C. to run a motor omnibus service from Berkhamsted to Watford.

SLOW TRAFFIC IN EAST LONDON.—The London Traffic Advisory Committee are asking local authorities in East London to display notices—"Slow moving traffic keep to the kerb"—in roads leading to the docks.

OMNIBUS SERVICE FOR RAILWAY EMPLOYEES.—Owing to the inconvenient train service, the Great Western Railway Company have provided omnibuses for the transport of their employees between Newport and Maesqlas.

SWANSEA OMNIBUS POLL.—As a town's meeting refused to agree to the clause in the Bill of Swansea Corporation seeking power to run omnibuses outside the borough, the Corporation have arranged to take a poll of the electors.

BRIDLINGTON SEEKING OMNIBUS POWERS.—The Improvements Bill to be promoted by Bridlington Corporation next session asks for powers to acquire and run omnibuses within the borough and to Flamborough. A town's meeting has approved of the Bill.

OMNIBUS LEVY APPEAL.—The National Steam Car Company, Limited, are appealing to the Ministry of Transport against the decision of the Northamptonshire County Council to levy a charge of 3d. per mile per omnibus on the route from Bedford to Northampton.

MIRRORS FOR MECHANICAL VEHICLES.—The Highways Committee of Gloucestershire County Council suggest a new by-law requiring a mirror to be provided on the off-side of all locomotives and four-wheeled motor vehicles to enable drivers to observe approaching traffic.

OMNIBUS SERVICES WITHOUT PERMITS.—Durham County Surveyor reports that several new omnibus services have been commenced on various roads in the county without the consent of the local authority as required. The Council are making inquiries into the matter.

RAILLESS CARS AT YORK.—Alderman Meyer, chairman of the Tramways Committee, has informed the Corporation that the four railless cars ordered would run about 100,000 miles, and their cost would be 4d. per mile less than petrol omnibuses, which would give a saving of about £1,500.

COST OF REPAIRING GOVERNMENT LORRIES.—Heston and Isleworth Urban Council purchased two petrol lorries from the War Department at a cost of £540 each, it being understood that the cost of repairs would be £200 to £350. The actual cost of repairs and provision of new tires proved to be £543.

LONDON COUNTY COUNCIL LORRIES COMPLAINED OF.—Stoke Newington Council have been complaining of the speed of lorries belonging to the London County Council Tramways Department, and suggest that the heavy vehicles should either go more slowly or be diverted to roads more suitable for such traffic.

STOCKTON CORPORATION OMNIBUSES.—The Ministry of Transport have notified the authorities concerned that they propose to consent to the running of omnibuses by Stockton Corporation along the routes from the borough boundary in Haverton Hill Road to Port Clarence, and from the borough boundary to a junction elsewhere.

CARS FOR DETECTIVE CHIEFS.—The Home Secretary has sanctioned the provision of cars for the four detective superintendents at Scotland Yard. That rank was recently conferred upon the four chief inspectors of the Criminal Investigation Department, but they had not then the advantage of having a car which was granted to the superintendents in the police force.

MOTOR HAULAGE AT RAILWAY GOODS RATES.—Bradford Chamber of Commerce has agreed with the Bradford Motor Owners' Association that Classes 2 and 3 of railway goods, comprising most of the raw materials and goods used in the wool and allied trades, shall be carried by motor wagons at railway goods rates. This is equivalent to a passenger train service at goods rates. The scheme will be worked through the Transport Bureau recently set up by the Chamber.

G.W.R. MOTOR FLEET.—In a report on the work of the traffic department during the year 1919 the *Great Western Railway Magazine* says:—"The fleet of road motor cars for passenger, parcels, and goods work was considerably augmented by the purchase of new cars, chiefly from the Associated Equipment Company, in addition to which the Government loaned to railway companies generally a large number of motor lorries. The number of mechanically-operated vehicles grew to nearly 400."

OMNIBUSES ON PNEUMATIC TIRES.—Since 1916 the Mesaba (U.S.A.) Transportation Company have run three ¾-ton chassis with omnibus bodies on pneumatic tires. These bodies carry 18 passengers. A number of 2-ton omnibuses are also operated, these having pneumatics in front and cushion tires in the rear. In all there are 18 vehicles employed, and the route extends over 30 miles. The heavier chassis carries 22 passengers, and both types are operated on the one-man system, the driver collecting the fares when the passengers enter at his end.

G.E.R. DEVELOPING MOTOR TRAFFIC.—Halesworth Urban Council have asked the Great Eastern Railway Company whether the heavy motor vehicle service which they are running in the district is likely to become permanent. The surveyor has reported that a continuance of the traffic will necessitate a heavy expenditure on the roads, or probably reconstruction. In view of a railway company being charged upon only one-fourth of the rate in an urban area, the surveyor suggested that the company should be asked to give pecuniary assistance.

RUNNING EXPENSES OF HEALTH DEPARTMENT VEHICLES.—The Health Department of Willesden Urban Council has had seven motor vehicles in use for four years, and they have covered altogether 201,125 miles. In 1918 the cost in pence per mile run was 13·64, compared with 11·78 in 1917; 12·08 in 1916, and 13·4 in 1915. The number of miles per gallon of petrol consumed was 10·15 in 1918, 10·73 in 1917, 11·75 in 1916, and 11 in 1915. The report gives the following figures, compiled by the accountant in respect of the year 1918:—Running expenses, 4·16d. per car-mile; wages, 4.90d. per car-mile; fixed and general charges, 2·41d. per car-mile; loan charges ,2·17d. per car-mile; total, 13·64d. per car-mile.

NEW OMNIBUS DEPOT FOR WOLVERHAMPTON.—At an estimated cost of £24,306, the Tramways Committee have advised Wolverhampton Corporation to extend the tramways depot by the erection of new workshops, administrative offices, and recreation room, a motor omnibus running shed with shops and stores, and a paint shop, with a car track, to enable tramcars to be dealt with. The scheme also includes the laying of a line of rails through the Cattle Market, joining up the lines in Bilston Street with those in Cleveland Road, so as to provide a much shorter journey for cars entering or leaving the depot. When the proposed new line is in use it is estimated that a saving of £550 per annum will be effected. The construction of the line is estimated to cost £3,000.

HALIFAX MOTOR OMNIBUSES.

The total income of the Halifax motor omnibuses, which are worked by Halifax Corporation Tramways Committee, for the year March 31, 1919, was £3,502 or 16·48d. per mile run as compared with £2,613 or 13·05d. per mile run last year, an increase of £889 or 3·43d. per mile run.

The expenditure was £3,444 or 16·20d. per mile run as compared with £3,090 or 15·43d. per mile run last year, an increase of £354 or ·77d. per mile run, which has resulted in a surplus of £59 as against a deficiency of £477 last year; in neither case is any allowance made for depreciation or interest on the capital outlay. An increase in fares came into operation on September 4, 1918, which largely contributes to the satisfactory financial result.

Appended are statistics showing the variation of mileage, income, and costs since the inception of the motor omnibus service:—

	Miles run.	Passengers Carried.	Receipts per Mile. d.	Average Fare per Passenger d.	Cost per Mile. d.	Profit or Loss per Mile. d.
1912-13	20,346	128,479	8·47	1·34	13·52	5·05
1913-14	68,385	434,826	8·95	1·41	9·56	− ·61
1914-15	67,438	423,006	8·88	1·41	8·11	+ ·77
1915-16	63,031	410,348	9·25	1·42	10·60	1·35
1916-17	61,102	433,573	10·05	1·41	10·69	− ·64
1917-18	48,054	449,188	13·05	1·39	15·43	2·38
1918-19	51,021	502,003	16·48	1·67	16·20	+ 28

SOUTHEND OMNIBUS SCHEME DEFERRED.

Southend Corporation's omnibus scheme is held up for the time being. A report of the Light Railway Committee states that they have again considered the report of the electrical engineer in regard to the provision of an omnibus service, showing the estimated income and expenditure, together with statistics of similar services in other towns. The committee also further considered tenders received for the provision of the vehicles.

In view of the congestion obtaining in the motor industry at the present time the probable increase in the cost of petrol, and the difficulty of obtaining materials at the present time of the road surface for the proposed routes, it was resolved that the further consideration of the matter be adjourned to next September.

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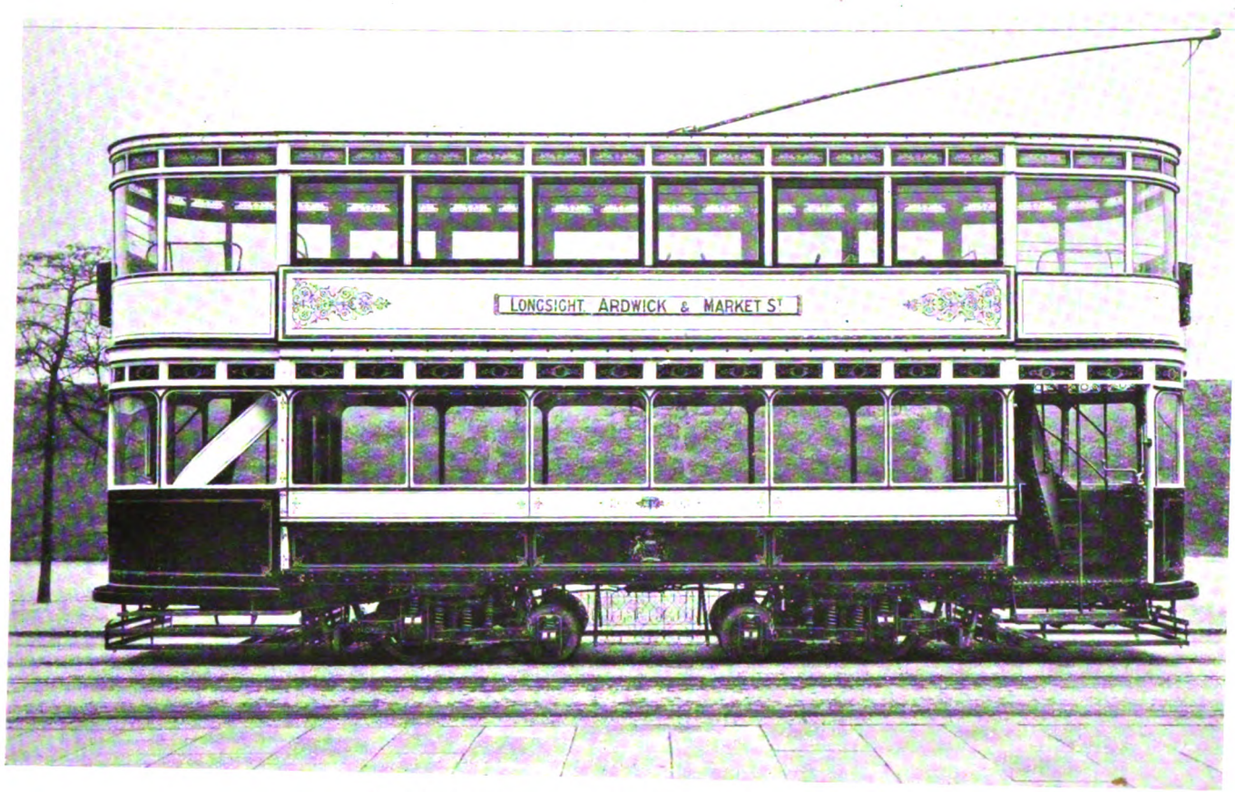
THE Tramway & Railway World
WITH MOTOR TRAFFIC SECTION

Founded 1892. LONDON, MARCH 18, 1920. VOL. XLVII.

STANDARD CAR OF THE MANCHESTER CORPORATION TRAMWAYS.

A DOUBLE-DECK BOGIE TYPE WITH VESTIBULE ENDS.

To Mr. J. M. McElroy, general manager of Manchester Corporation Tramways, we are indebted for further particulars of the top covered car on bogie trucks which the Manchester Corporation Tramways Committee have adopted as the standard car for the city. It was briefly described and illustrated in our issue of February 12, but the accompanying photograph and drawings enable a better idea to be obtained of this carefully designed car, and of the partial conversion of the platforms into vestibuled ends.



Manchester Corporation Standard Tramway Car.

The side of the platform where passengers ascend is unenclosed. To prevent a draught past the motorman and up into the top deck a novel form of cutting off communication from the front staircase to the upper saloon has been adopted. In lieu of the partition and door generally fitted between the roof and the platform canopy there is an arrangement of folding trapdoors. By this plan there is less glass which can be broken in a violent collision, with possible injury to passengers over the canopy. A railing effectively prevents a passenger from taking a side step on to the trapdoor. The absence of a partition and door serves also to give the top apartment a more commodious appearance and it seats 46 persons; downstairs there is accommodation for 32. The weight in running order is 13 tons 14 cwt. The body is mounted on Brill maximum traction trucks.

The car is fitted with two G.E. 200 motors, Dick Kerr K.4 controllers, and resistance supplied by the Electro-Mechanical Brake Company. Peacock hand brakes are fitted, the rheostatic brake being used for emergency purposes only. Taylor's sand tubes and Cummins' automatic sander are fitted, by means of which, in case of emergency, both rails can be sanded by the application of the rheostatic brake. Lifeguards are of the Hudson and Bowring type with Phillipson's side and step guards.

Many of these cars are being built by the English

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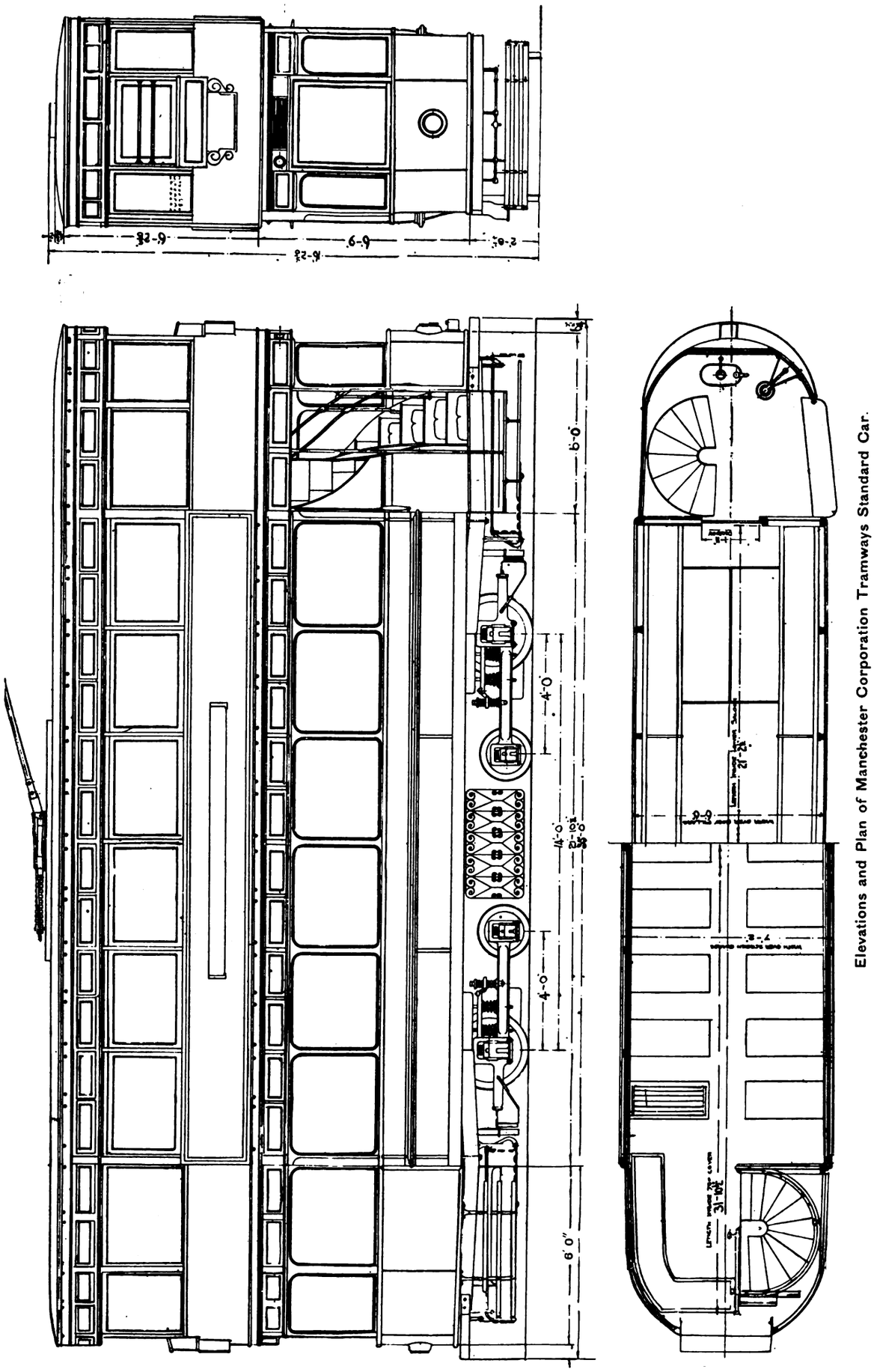

Elevations and Plan of Manchester Corporation Tramways Standard Car.

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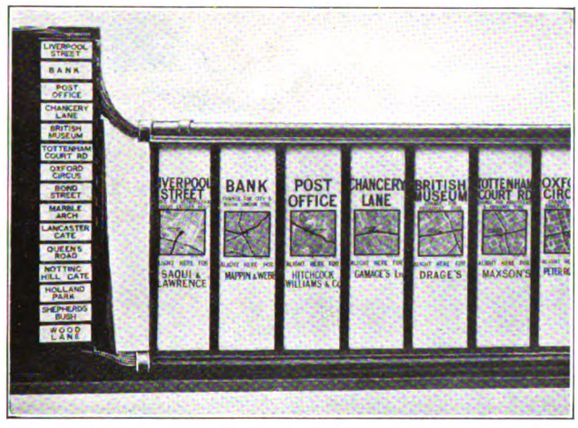
Electric Company. The principal dimensions of the body and trucks are as follows—

Wheel base—total, 14 ft 0 in.; truck, 4 ft. 0 in.
Diameter of driving wheels, 32½ in.; pony wheels, 21 in.
Diameter of driving axles, 4¼ in.; pony axles, 3½ in.
Length over fenders, 35 ft. 0 in.; body outside, 21 ft. 10½ in.; body inside, 21 ft. 2½ in; platforms, 6 ft. 0 in
Width over body posts, 6 ft. 6 in.; over screen boards, 7 ft. 2 in.; over floor sills, 6 ft. 0 in.
Height—lower saloon, 6 ft. 7¾ in.; upper saloon, 6 ft. 1½ in.
Height—end door opening, lower saloon, 5 ft. 11½ in.
Height of floor above rail, 2 ft. 8¼ in.
Height, rail to under side of trolley standard, 16 ft. 2⅝ in.
Total height from rail over trolley base, 16 ft. 7⅝ in.

INDICATORS FOR STOPPING-PLACES.

An Ingenious Traffic Regulating Device for Electric Railways and Tramways.

Volumes have been written of late about the congested state of passenger traffic, and in nearly every case the problem has been attacked at the wrong end. More time is lost by people getting out of trains than by people getting in, and the problem is not solved by hustling passengers on the station platforms who are already eagerly waiting to take their places in the train. Almost invariably it is the inside passenger that is unprepared. There is no need to emphasise the shortage of rolling stock, and it is doubtful if much is to be gained by efforts to pack



Machine in Carriage Indicating the Approaching Station.

the carriages closer, nor to drive the public by shouting at them. It is probably a sounder system to rely upon the average intelligence of the travelling public and to give them every possible opportunity of remaining well informed of the progress of their journey. In this way passengers will be ready to alight instantly upon arrival at their destination.

Looking upon the London traffic problem, it has been stated that over a hundred new railway cars are on order, but a hundred cars in London can make comparatively little difference. If the whole system were doubled, track as well as carriages, it would not do away with the difficulties. It will take a long time under present conditions to increase the rolling stock to such an extent as greatly to affect the congestion during the rush hours, and if the figures are studied from the point of view of the railway companies, there is nothing to induce them to build extra lines. The whole problem, therefore, evolves around the one main question, "speed up the train service."

The Metropolitan Railway has adopted an ingenious system devised by Indicators, Limited, 11, Southampton Row, W.C., which strikes at the very root of the evil by inducing the travelling public to get ready to alight before reaching their destination. This device has been the outcome of a very careful investigation.

It has been computed that two passengers on a train in the rush hours of the day being undecided what to do and alighting at the last minute may hold up a train for half a minute. The 30 seconds translated into arrivals of passengers at one of the busy stations means 150 more people on the platform—the next succeeding train will have more travellers to load and will add to the 30 seconds already lost, and the cumulative effect is the well-known congestion.

It is claimed for the new indicator that by giving an early intimation to the traveller of the approach of his station in a convenient and insistent manner a smooth working of the train service will be ensured. Several machines consisting of a series of transparent glass panels will be installed in each carriage. Each of these glass panels contains the name of the station, a small map of the surrounding district, and other information appertaining to that particular station of interest to the traveller. This is all the passenger will see, and, as the train progresses on its journey, these panels are successively illuminated so that the next stopping place is always clearly shown. Every station passed without stopping is indicated continuously by an illumination of the words "not stopping at". A portion of the apparatus is shown in an illustration.

The whole system works automatically, and once a train has left its terminus and every non-stopping station has been indicated by a main switch from the driver's carriage, a train may go forward or backward for some reason or another, yet the information on the apparatus will always be correct. A striker on the track at the point where a train leaves the station gives impetus to a receiving apparatus in the train; special provision has been made on this to ensure the registry of the train's passage in any direction The receiving apparatus controls a rotary contact device which serves the lamps behind the transparent screens on the Indicator.

Every possible provision has been made to ensure the apparatus performing its task, and the patents contain several ingenious features which make its work absolutely certain. One of these is the cutting out of the non-stop stations. If station G is to be passed without stopping, in leaving station F, the station H must be shown as the next station. This can be arranged at will for any station on the journey.

The London County Council have agreed to make a test of these machines on their No. 35 tramway service. Here, of course, no skip-stops occur, but there is no indication of the tramcar's position except to the traveller well acquainted with its journey. The compulsory stopping places of the tramcar are indicated in separate panels and the required stops are shown on the maps, otherwise the system is identically the same as on the electric trains, and easily adapted to either overhead or underground conduit.

The Indicators will make their first appearance on the Great Northern and City Tube, which is controlled by the Metropolitan Railway, and it will then gradually spread to all the other routes of this railway.

There is no reason to doubt that the travelling public will greatly appreciate this innovation, especially when it is found out that it will speed up the service, and it is confidently hoped that it will rapidly educate the travellers to get to the doors of a train or the platform of a tramcar before it stops. No doubt the railway company, by enrolling the help of the travelling public in this interesting manner, will remove grave causes for anxiety and avoid considerable inconvenience.

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RAIL REMODELLING.

Some very useful and interesting tests have recently been made by Messrs. David Kirkaldy and Son on behalf of the Woods Gilbert Rail Remodelling Company, Ltd., the result of which adds some valuable statistics regarding permanent way work. Hitherto it has been a matter of opinion and speculation as to the amount of metal essential to be left in the bottom of the grooves to withstand the lateral load caused by oscillation of cars and the heavy vehicular traffic, and these tests were made with a view to obtaining correct records of the temporary and permanent deflections, and the breaking load of rails with varying thicknesses of metal beneath the groove. All the tests were made on sections of British standard rails which had been in use for upwards of ten years. Each section measured two feet in length, and was machined in the bottom of the groove to obtain the required thickness; and to prevent the web breaking, the rail was rigidly supported throughout by fishplates. The load was applied along the whole length of the edge of the lip.

The first section tested had $\frac{5}{16}$ in. of metal beneath the groove, and gave the following temporary and permanent deflections—

LOAD.	TEMPORARY DEFLECTION.	PERMANENT DEFLECTION.
40,000 lbs.	·03 in.	—
42,000 lbs.	·05 in.	—
45,000 lbs.	·08 in.	·03 in.
46,000 lbs.	·09 in.	—

47,900 lbs. (21·4 tons), the lip gave way.

The next test was made on a rail with $\frac{3}{8}$ in. thickness beneath the groove. On this section the following temporary and permanent deflections were registered—

LOAD.	TEMPORARY DEFLECTION	PERMANENT DEFLECTION
40,000 lbs.	·01 in.	—
50,000 lbs.	·02 in.	—
60,000 lbs.	·03 in.	—
65,000 lbs.	·04 in.	·01 in.
70,000 lbs.	·07 in.	·05 in.
74,000 lbs.	·1 in.	·08 in
76,000 lbs.	·12 in.	—
78,000 lbs.	·14 in.	—

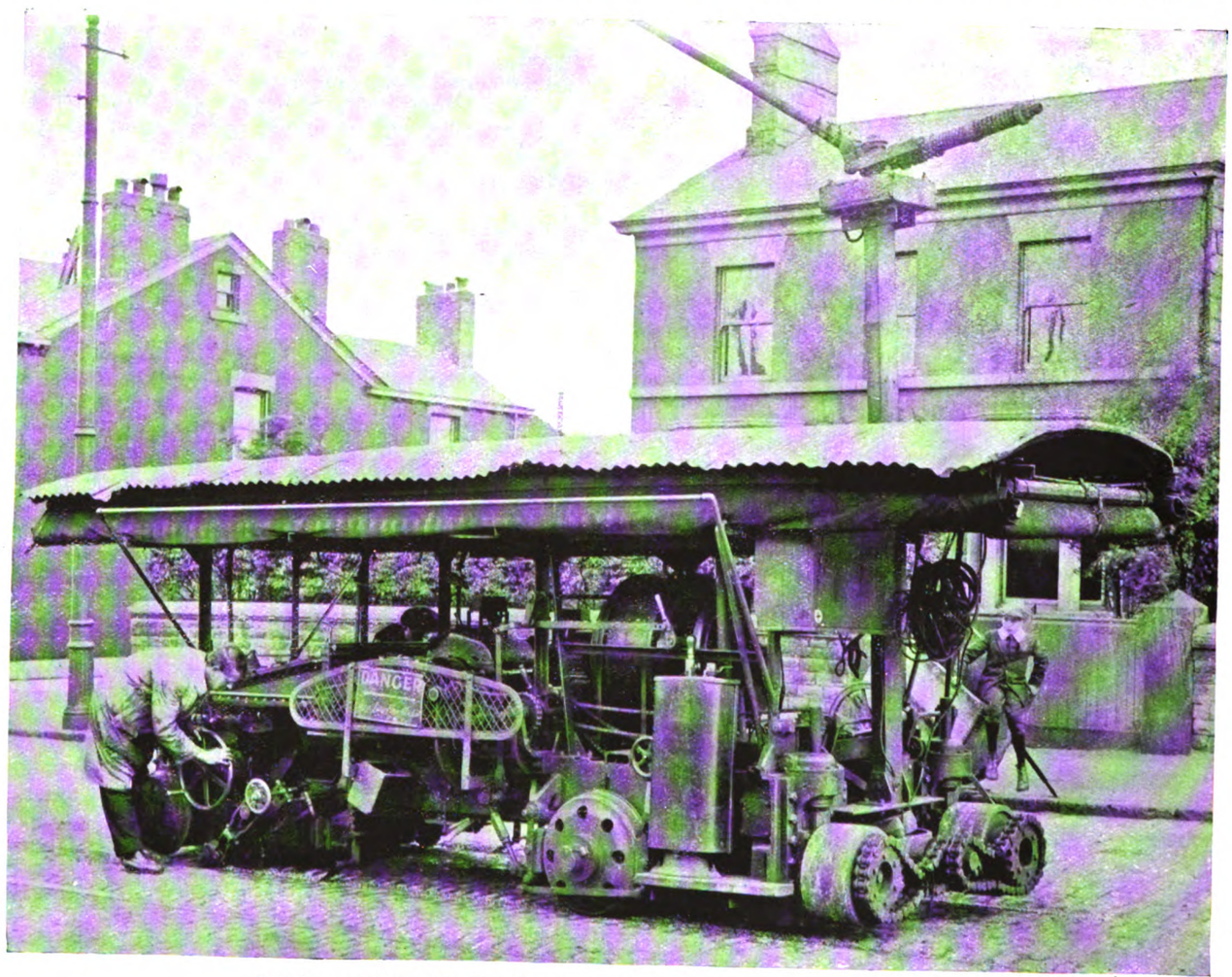
80,000 lbs. (35·7 tons), the lip gave way.

The third section was with a thickness of $\frac{7}{16}$ in. of metal beneath the groove, and this showed the following deflections—

LOAD.	TEMPORARY DEFLECTION.	PERMANENT DEFLECTION.
60,000 lbs.	·01 in.	—
70,000 lbs.	·02 in.	—
80,000 lbs.	·03 in.	—
90,000 lbs.	·05 in.	·02 in.
92,000 lbs.	·06 in.	—
94,000 lbs.	·08 in.	·05 in.
96,000 lbs.	·1 in.	—
98,000 lbs.	·13 in.	—
100,000 lbs.	·14 in.	·11 in.
102,000 lbs.	·16 in.	—
104,000 lbs.	·18 in.	—

106,000 lbs. (47·3 tons), the lip gave way.

The fourth section had $\frac{1}{2}$ in. of metal beneath the groove, and showed the following deflections—



Rail Remodelling Machine Worked with Current from the Trolley Wire.

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LOAD.	TEMPORARY DEFLECTION.	PERMANENT DEFLECTION
80,000 lbs. ...	·02 in. ...	—
105,000 lbs. ...	·03 in. ...	·01 in.
110,000 lbs. ...	·04 in. ...	·02 in.

110,400 lbs. (49·3 tons), the lip gave way.

Comparing these figures, it will be seen that the extra $\frac{1}{16}$ in. thickness between the first and second tests gave additional strength of 14·3 tons, whilst the extra $\frac{1}{16}$ in. between the second and third tests only gave additional strength of 11·6 tons, and the extra $\frac{1}{16}$ in. between the third and fourth tests 2 tons only.

WELDING ON NEW ENGLAND RAILWAYS.

References to rail welding were made in a paper on "Maintenance of Way for Street Railways," read by Mr. W. R. Dunham, jun., at a meeting of the New England Street Railway Club at Boston. Mr. Dunham said that in 1908, 1909, 1910, and 1911 they welded by the Lorain process 15,000 joints in various sections of rails, mostly high tee and girder, and this welding had been a success in so far as the object for which it was done was concerned. Some of the rail welded had to be removed, due to municipal paving work, but the percentage of actual joint failures had been low, and most of the rail welded had been in service fifteen years or more under city traffic before the welding was done. On one division in 1918 they repaired 358 broken rails in paved streets by welding plates across the breaks. The old method of repair was to cut out a section of rail about 8 feet long, put in a new piece, and bolt it up; this gave two joints where there was but one before. By the new method, after welding the plates to the rail, and, if necessary, building up the surface and grinding, there was no joint. The saving in cost of the new method was 8,420 dollars, or nearly twenty-three dollars per joint.

Questioned as to whether he had had any trouble from rails that become heated too high and breaking away, Mr. Dunham said that he could not recall any instance with the later methods of welding used on the Connecticut Company's lines.

Mr. L. J. Miller said in this connection that he had found that on rails that have been battered down on the surface, the rail had become flattened and that they had come to the conclusion it was brought about by the fact that the rail was broken away from the web before welding, and consequently broke out afterwards.

Mr. C. M. Worth stated that with the Lincoln welding it has been his experience that it did not heat the rail head enough to change it and consequently it did not break away. Four or five thousand joints had been placed in Boston, and he had not heard of a single instance of this.

Mr. Depler stated that with the Thermit process on the repair of pounded joints, the practice was simply to raise the rails by loosening the first spikes until the running surface is up to height beyond the pounded joint, and then weld it in that position and grind the joint level. He also stated that the old type of welding consisted of welding the full rail section without putting an insert on the running section. That method did not allow for the fact that the Thermit steel is a case steel, and consequently would pound by the rolling of the wheels. In the matter of insert welds, he said that they had yet to find one which had proved defective from wear or breakage, and he could not see any possibility of breakage, as the welded steel is exactly the same composition as that of the rail.

NEWPORT TRACK RECONSTRUCTION.

A report on the permanent way of the Newport Corporation Tramways has been presented to the Tramways Committee by Mr. A. Nichols Moore, the borough electrical and tramways engineer. It covers the period April, 1912-February, 1919, and has special reference to probable expenditure, 1919-1926. As the report was presented in April last, and the cost of materials has continued to rise, the estimates for the work advised by Mr. Moore are likely to be exceeded.

COMPARATIVE COST, 1914-1919.

Mr. Moore was careful to point out that the cost was based on the prices then prevailing, as shown in the appended comparative table for labour, hauling, and materials in the period 1914-1919—

Description.	@ per	1914. £ s. d.	1919. £ s. d.	Increase. %
LABOUR —				
Skilled	hour	0 0 7½	0 1 4·736	123·15
Unskilled	,,	0 0 6½	0 1 3	130·77
HAULING	,,	0 1 3	0 1 10½	50·0
MATERIAL — ...				
Rails	ton	7·13 0	15 17 6½	107·5
Fishplates	pair	0 4 7	0 11 4½	147·3
Tiebars	each	0 1 2½	0 3 10	217·3
Fishbolts	,,	0 0 3 1/16	0 0 10½	238·7
Bonds, Joint	,,	0 2 1	0 3 8 1/16	76·4
,, Cross	each, average	0 4 6	0 5 4 3/16	19·07
Granite Setts	ton	1 8 0	2 6 0	66·4
Wood Blocks	100	0 13 6	1 14 0	152·0
Asphalte Blocks ...	sup. yard	None in use	0 17 6	—
Plascom...	ton	2 8 0	3 15 5½	57·12
Chippings (granite) ...	,,	0 7 7	0 18 6	144·0
Broken Stone	,,	0 4 9	0 10 9	126·3
Sand or Gravel ...	,,	0 4 6	0 10 7½	136·1
Cement	,,	1 19 0	3 13 6	88·4
Paraffin	gallon	0 0 6 3/16	0 1 2	133·0
Coal	ton	0 19 3	2 0 0	107·8
Coke	,,	0 18 6	1 10 0	62·3
Carbic	cake	0 0 7	0 1 7 1/6	171·3
Oxygen	100 ft.	0 4 0	0 4 0	—
Points, Spring	each	0 1 6	0 1 10	22·0
Drain Boxes (cast steel)	,,	0 18 6	1 12 6	37·8
Drain Pipes (stoneware)	,,	0 0 6½	0 1 10½	256·0
,, ,, ,,	,,	0 0 9½	0 2 4 3/4	181·6
,, ,, ,,	,,	0 1 7	0 2 9½	153·0
,, ,, ,,	,,	0 2 9	0 4 7½	68·2
Anchor Grips	pair	0 4 0	0 8 0	100·0
Anchors	each	0 3 0	0 6 0	100·0

Other tables show the capital and revenue expenditure on the permanent way from 1903-4 to 1918-19, an analysis of permanent way repair costs from 1913 to 1919, and an analysis of permanent way renewal costs for the same period. There are also plans (reproduced on the following page) showing the old and new method of track construction. A reference plan accompanied the report, indicating in colours the various conditions of the permanent way, which has a total route length of 8·09 miles, with 15·579 miles of track. The various conditions are given in the following percentages—New or re-constructed, 12·912 per cent.; good for seven years, 17·952; good for four years, 24·769; good for two years, 8·492; very bad, 35·875 per cent.

BOARD OF TRADE COMMITTEE'S INSPECTION.

In November, 1913, a special sub-committee of the Works and General Purposes and the Electricity and Tramways Committees was appointed to consider the whole question, and in February, 1914, the borough engineer and Mr. Moore submitted a report upon the probable cost of putting the tracks in good order. Upon the information available then it was estimated that it would be necessary to provide a minimum sum of £29,729 to be spread over a period of three to four years. Towards this amount the Works and General Purposes Committee undertook to provide a sum not exceeding £2,000 per annum for four years under certain stipulated

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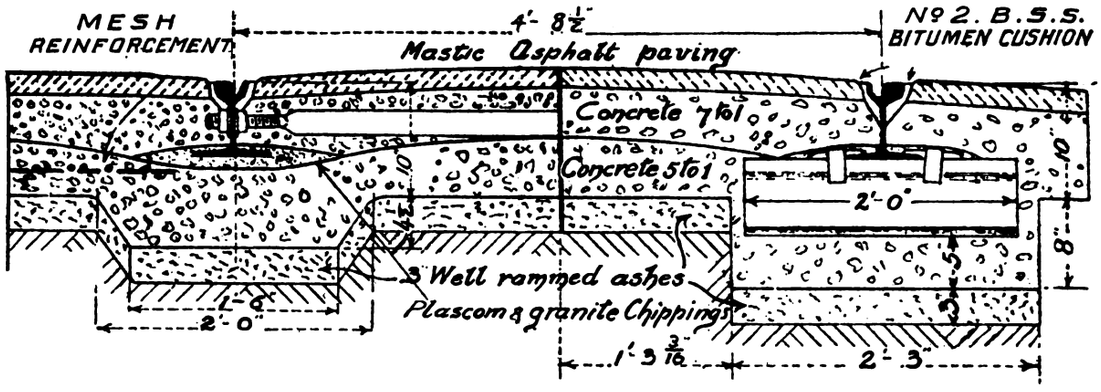
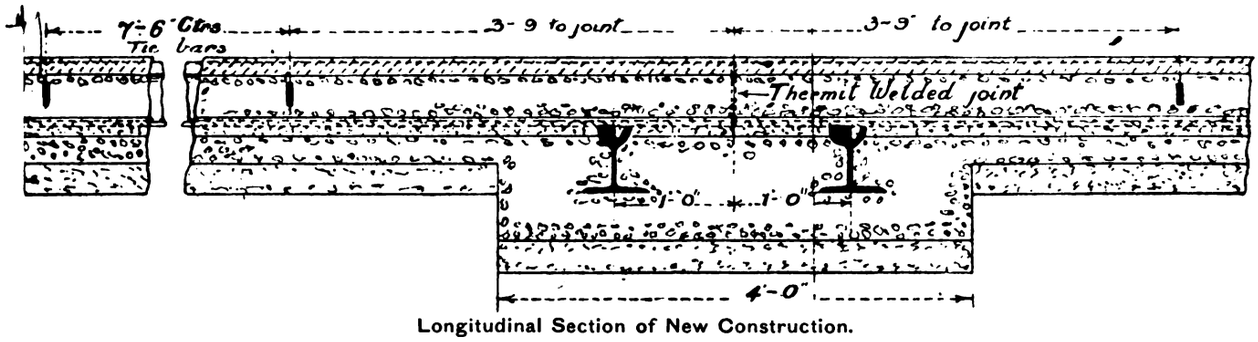
conditions, and the permanent way department was re-transferred to the Works Committee, with Mr. Moore as the chief responsible officer. The outbreak of the war rendered all estimates practically useless. Further, the additional knowledge gained since then as to the condition of the foundations has necessitated a complete revision in every particular. Notwithstanding the adverse and abnormal conditions existing during the past 4½ years, considerable progress has been made in the direction of substantially and permanently improving the condition of the tracks. At least 50 per cent. of the track mileage is now in a reasonably good condition. Mr. Moore had various opportunities during 1918-19 of observing



SECTION AT TIE BAR CENTRES. CROSS SECTION AT ANCHOR CENTRES.

Cross Section of New Construction on Newport Corporation Tramways.

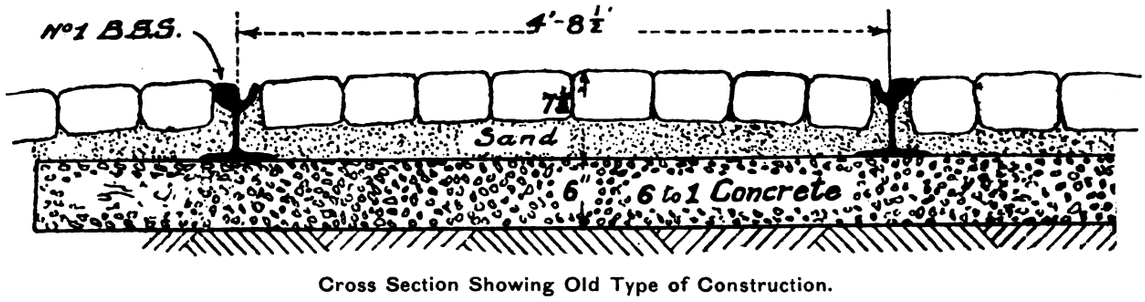


Longitudinal Section of New Construction.

of £2,250 to cover general maintenance, subsequent to reconstruction during the period. This estimate is based upon a reasonably accurate knowledge of their present condition, and the requirements as governed by local general physical conditions, and the detailed costs have been obtained after careful calculation as to the probable price per yard for the various classes of work. The only hope of any reduction in this figure is by a general reduction in the price of materials when normal peace conditions obtain, and by the adoption of labour-saving machinery, mechanical haulage, and employment of more efficient labour.

Mr. Moore advises reduction of manual labour by the use of automatic concrete mixers, pneumatic punchers, and drillers for breaking up existing concrete beds, etc. In the matter of improved haulage arrangements, he states that owing to the high rates for hire the cost of hauling is out of proportion to the cost of the works, and roughly at the present time it is 10 per cent. of the cost. He is giving careful consideration to the question whether it is better to use vehicles making direct use of the tramway lines or else mechanically operated road vehicles. Mr. Moore advocates the discontinuance of reconstruction during winter months, owing to the increased cost and less satisfactory result of such work.

the condition of tracks in a number of other towns, and he is satisfied that the Newport tracks have been maintained well above the average, and much more done than in the majority of cases towards the renewal of the tracks. In this connection he reminds the committee that when the Board of Trade Committee recently made an official inspection, they expressed the opinion that notwithstanding the dilapidated condition of much of the track, taken as a whole it was in a very much better condition than the majority they had inspected. Owing to the disintegration of the track being general throughout, it had been extremely difficult, the engineer



Cross Section Showing Old Type of Construction.

remarked, to deal with the work in a satisfactory manner, chiefly owing to the limited amount of labour available, and that of a very inefficient nature.

LABOUR-SAVING MACHINERY.—MECHANICAL HAULAGE.

The total expenditure on all routes during the past seven years has been £63,980 14s., which includes both repairs and renewals; in addition, various works chargeable to capital have been executed at a cost of £16,519. The approximate expenditure which Mr. Moore is of the opinion it will be necessary to incur—based on present prices—upon the various routes, including an allowance of £32,176 for general maintenance, is £126,062, which also includes a sum

Regarding the work still to be carried out, he is of the opinion that nothing but complete renewals should be considered, excepting that on probably some 50 per cent. of the remaining track to be dealt with the existing rail may with advantage be used again, and also a considerable portion of the sett paving, providing it is re-dressed. Dealing with an assertion that greater economy could be secured by contract work, he states that the manner in which the Newport light railway works (the dockyard extension) were executed and the cost should convince the committee that to save money they would be well advised to continue the new policy of executing the work by direct labour.

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THE EXTENSION OF RAILWAY ELECTRIFICATION.

Chairmen on Pending Schemes.

In these difficult times—difficult for railway companies as for everybody else—it is gratifying to find that the directors of a number of English railway companies see their way towards very considerable developments of electric traction. At the annual meetings of the companies held during February a number of the chairmen referred in some detail to the developments in electric traction which are in view. In spite of the high present cost of labour and materials, the Boards believe that electricity provides such advantages that its use will pay. Electrification of busy lines is now more urgent than ever from the traffic point of view because of the great increase of the demands on the railways, and it is by means of electric traction that the carrying capacity of a railway can be vastly augmented.

It will be observed from extracts from the chairmen's speeches given below that it is expected that the financial assistance of Government will be granted for carrying out the work. As the railways are still under State control, the consent of the Ministry of Transport is, of course, necessary, and as to financial aid, that is provided for in Section 17 of the Ministry of Transport Act. That section says that the Minister may make advances out of moneys provided by Parliament to any authority, company, or person, either by grant or loan, for, among other things, the construction, improvement, or maintenance of railways, light railways, or tramways. Electrification should certainly come under the head of improvement.

While the chairmen are, like everybody else, in the dark as to what exactly will happen when the period of State control comes to an end, they are fairly hopeful as to the future, and the appended extracts show how confident they have become of the great benefits to be derived from electrification. But for the war much of the proposed work would doubtless have been carried out by this time.

GREAT EASTERN RAILWAY.

The Suburban Zone Specially Suitable for Electric Traction.

Sir A. E. Fellowes (deputy chairman, in the absence of Lord C. Hamilton, chairman).—With a view of meeting the increasing demands made on the company's railway in consequence of the growing traffic, and also to assist in the further development of the system, the Board had instructed the general manager, acting in conjunction with other experts, to prepare a scheme of electrification. Sir Henry Thornton was devoting much time and attention to the subject, which necessarily claimed thorough and exhaustive investigation. In the opinion of the general manager the suburban zone served by the Great Eastern Railway lent itself more readily to electrification than did the conditions in most other suburban areas, because the Great Eastern had a great density of traffic, a number of diverging routes centreing in one terminus, and an immediate and pressing demand for increased passenger facilities. The investigation had not proceeded far enough to permit predictions as to the financial results, but it might be said that material economies, coupled with a large stimulation of travel, were not beyond the bounds of possibility.

GREAT WESTERN RAILWAY.

Contracts Let for Electric Equipment of Ealing and Shepherd's Bush Railway.

Viscount Churchill.—At the moment one of the principal works in hand was the electrification of the Ealing and Shepherd's Bush Railway. This line was completed in 1917 for steam trains, but it had only recently been possible to obtain contracts for the equipment for electric traction. The directors were hopeful that this work might be carried through in the course of a few months.

LANCASHIRE AND YORKSHIRE RAILWAY.

Results of Electrified Lines Encourage Extensions.

Mr. E. B. Fielden.—The directors were satisfied with the results of the electrification of the company's lines both in the Liverpool district and between Manchester and Bury, and they were of opinion that the time had now arrived when the electrification should be extended to a further portion of the line, which they contemplated should be between Manchester and Oldham, and on to Shaw and Royton. It would be necessary in the near future to modernise and extend the power-house at Formby, which was now working to the full limit of its capacity. The traffic on the electrified lines in the neighbourhood of Liverpool continued to grow, and they could not face any further increase in the demands for power without adding to the equipment. It was not possible to state at present what policy the Government would decide to adopt in regard to the future of railways. Unless, however, the Government were prepared to find the capital, such pressing and financially promising developments as the extension of the fish dock at Fleetwood and the electrification of the line in the Oldham area must remain in abeyance.

LONDON, BRIGHTON, AND SOUTH COAST RAILWAY.

Relief from Congestion in Further Electrification.

The Earl of Bessborough.—In 1913, 80,000,000 passengers passed over the railway, while last year the number was 106,000,000, an increase of over 30 per cent. On the other hand, the train mileage showed a reduction of about 3,000,000 miles as compared with 1913, or about 27 per cent. The result had been overcrowding and congestion. At the rush hours the number of trains into the termini at London Bridge and Victoria was so large, and the railway between London and Croydon was so congested, that it was not possible to squeeze in another train. The directors' great hope was in electrification. The relief obtained by the quicker working of electric trains in and out of the termini and the advantage these services showed over steam services in stopping and starting were so considerable that if the Board could only carry out the programme laid down before the war to extend the electrical services throughout the whole of the company's suburban area they could unquestionably greatly improve the travelling facilities when and where they were most needed. The problem had been laid before the Government, together with full statistics of the volume and density of the traffic, and the attention which the Government were giving to the matter gave the directors hope that at an early date they might have authority to proceed with this very important work. Before, however, they started the electrification scheme, they would require assistance from the Government.

LONDON AND NORTH-WESTERN RAILWAY.

Advantages of Electrification of Suburban Lines.

Sir G. H. Claughton.—The capital expenditure during the past year included £150,000 for the widening of the line between Chalk Farm and Willesden for the electric service, and it was in the interest of the company that that work should be proceeded with and completed as early as possible to provide for the increased traffic which they might certainly expect in the future. The other large item was for new electric trains, without which they could not establish the full service between London and Watford, and for which the contracts were let before the war. With regard to the electrification of the company's suburban lines the restriction which had been placed by the Government during the war upon the carrying out of the works necessary to complete the last section of the line—viz., between Chalk Farm and Queen's Park—had been withdrawn. The works had not yet been completed, but they were actively in progress. The company had, however, been able for some months past, in conjunction with the underground company, to run a more frequent service of electric trains between Watford, Queen's Park, and Waterloo, and they hoped shortly to be able to put into that service several of the new trains which were being built specially for it. Judging from the ever increasing number of passengers using the tube trains to and from this company's line, they might also confidently look forward to a largely increased traffic to Euston and Broad Street when they were able to run their full through services, which he trusted would not be much longer delayed. Every effort was being made to complete the line, and obtain delivery of the necessary additional rolling stock as soon as possible.

LONDON AND SOUTH-WESTERN RAILWAY.

Enormous Increase of Traffic on Electric Routes.

Brig.-Gen. H. W. Drummond.—In 1913 the number of local passengers carried on the company's suburban lines which had since been electrified was 25,000,000. Towards the end of 1915 they opened the first section of the electrified lines, viz., from Waterloo to Wimbledon via East Putney, followed at close intervals by other sections. Last year they carried over those sections just under 48,000,000 of passengers, an increase of 70,000 per day as compared with 1915. The scheme submitted in 1913 provided for the electrification of the whole of the suburban and the outer suburban area as far as Guildford, and but for the war they would have been able to go on with the complete scheme. Unfortunately the war did intervene, and whilst the traffic increased at an enormous rate, the equipment of the line remained at a standstill, and he was afraid it would be some time before they were able to overtake the arrears brought about by nearly six years of stagnation. In June last the Board gave an order for the conversion of additional coaches for strengthening the existing electrical services. Unfortunately,

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the moulders' strike supervened, and none of the castings which were ordered had yet come to hand. This strike only came to an end in January. They hoped to get the bulk of them delivered by the end of March. This would enable them to bring up certain of their electric trains to eight coaches instead of six during the rush hours, which should go a long way towards relieving congestion. So far as overcrowding on the Waterloo and City Railway is concerned, they had determined to do two things. First, to supersede the present electrical equipment, which was out of date, by modern equipment, so as to increase the speed of the trains up the incline. This would enable them to run twenty-four trains an hour instead of twenty. They were also ordering some additional all-steel coaches so as to lengthen the trains to six coaches instead of five. They were also considering the question of extending the electrification to cover the Cobham and Leatherhead lines as far as Guildford. The estimated cost of this, including the necessary coaches, was about £750,000, or about three times what it would have cost at pre-war prices. Notwithstanding that, the advantages of an electric service were so pronounced they would have no hesitation in giving an order for the work to proceed.

NORTH EASTERN RAILWAY.

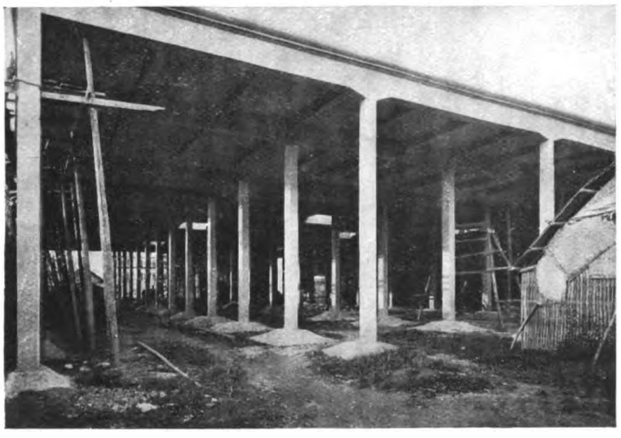
SCHEME SANCTIONED FOR ELECTRIFICATION OF 80 MILES OF TRACK.

Lord KNARESBOROUGH.—The directors had for some time had under consideration, and had provisionally sanctioned, a scheme for the electrification of their main line between York and Newcastle, a distance of 80 miles, the details of which had been worked out by Sir Vincent Raven, chief mechanical engineer to the company, in conjunction with their traffic officers, and Messrs. Merz and McLellan, consulting electrical engineers to the company. On this portion of the railway there was a very heavy and varied traffic, ranging from East Coast and other important through trains to local pick-ups. Hitherto the experience of the company with electric traction had been confined to the working of a dense local passenger traffic on Tyneside between Newcastle, North Shields, Tynemouth, and Whitley Bay, and of the mineral traffic between Shildon and Newport (Middlesbrough). The former was opened in March, 1904, and the latter in 1915. In both cases the company claimed to be pioneers in these forms of electric traction in this country, and the results obtained had proved satisfactory. As regarded passenger electric train service, they were closely followed by the Lancashire and Yorkshire Railway, with the electrification of their line between Liverpool and Southport, which was also opened in 1904. Since then there had been considerable developments in the London area. No other company in Great Britain had, however, so far experimented with the electric haulage of freight trains.

CAR CONSTRUCTION BY SHANGHAI TRAMWAYS.

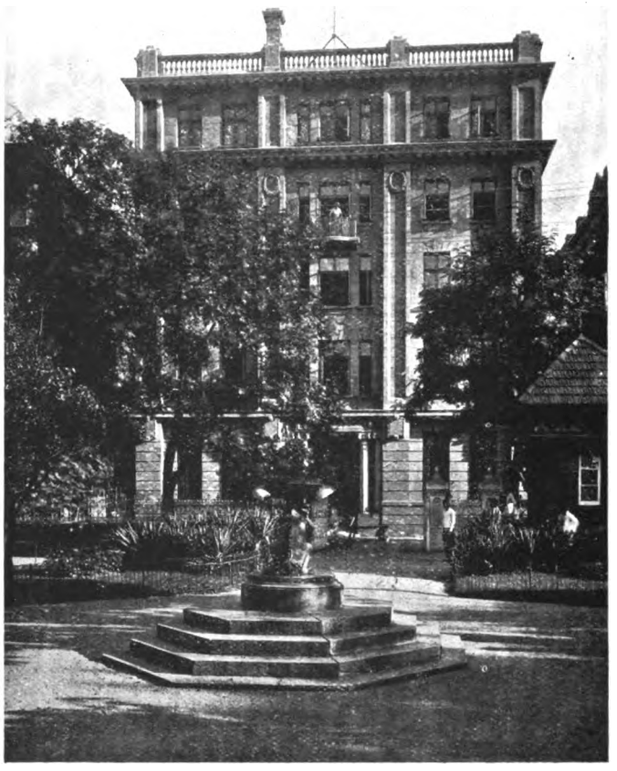
RAILLESS CAR DEPOT.

Mr. D. McColl, general manager of the Shanghai Electric Construction Company, Limited, has sent to us some information with regard to the decision to build their own cars. The company have now erected an extension to one of their existing depots, part of which is shown in the accompanying illustration that was taken just before the construction of pits for tramcars and railless cars was commenced. The building is of reinforced concrete.



Shanghai Depot of Reinforced Concrete Under Construction for Railless Cars.

It is the intention of the company to use part of this building for the construction of car bodies both for tramway cars and railless cars. The bodies of twenty-five of the present tramway motor cars and sixty-eight of the trailer cars have been built in Shanghai, and in the new building the construction of fifteen trailer tramway car bodies and seven railless cars has been commenced. The company now find it more economical to build bodies in Shanghai than to import them. Practically all the wood employed in the construction of the bodies is teak, and this can be obtained much more cheaply in the Far East than at home, while local wages are, of course, on a much lower scale. There is the further advantage of saving the heavy freight charges for the 10,000 miles' journey from the United Kingdom to Shanghai. It is, of course, necessary to import steel of various sizes, electrical equipment, car wheels, tires, etc., but most of the castings and forgings, etc., required are made locally.



Shanghai Tramway Company's Offices.

Altogether the company has found it necessary, in order to permit development going forward without over-capitalisation, to utilise local resources in the way indicated, but consistently with that principle the company does its utmost to place orders with manufacturers in the United Kingdom, although, adds Mr. McColl, it has to be confessed that in these days it is rendered unusually difficult by the reluctance of British manufacturers in many cases to give firm tenders or any satisfactory indication as to the date of delivery.

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THE MINISTRY OF TRANSPORT AT WORK.

In the House of Commons on March 9 the first general review of the work of the Ministry of Transport was presented. The occasion was the submitting to the House in Committee of Supply of a vote for £181,061 for salaries and expenses of the Ministry. Sir Eric Geddes, Minister of Transport, was absent through indisposition, so the task of setting forth what has been done was carried out by Mr. A. Neal, Parliamentary Secretary to the Ministry.

Mr. Neal said that considerable misconception existed as to what the Minister was doing. The Minister was not attempting the task of regulating and controlling the detailed working of the railways. That was in the hands of the railway companies, and the nation would wish it to be so. The success which had so far attended the work of the Ministry was indicated by the fact that undertakings which had sought to be excluded were now asking to come under the ægis of the Ministry. The Minister was diligently pursuing the major task given to him, namely, to advise what should be the future policy with reference to the railways. Coming to the different departments of the Ministry, the development department had now nearly 100 cases relating to light railways before it. As to the traffic department, it had, among other things, been concerned in the question of rolling stock. Steps had been taken to secure acceleration of construction; 17,000 wagons had been or were being built in the railway workshops, and orders for 16,000 more had been placed by the companies with outside firms. With reference to the road department, it had the administration of the £8,000,000 which was supplemented by £2,000,000 to deal with road development. In addition there was the classification of the roads of this country, which was well in hand. There was the question of the regulation of road vehicles, and the revision of the method of taxing and securing revenue for road purposes. The department also dealt with the lighting of road vehicles and the applications by local authorities for grants or powers to borrow money for highway purposes. The Ministry was running a boat between the Channel Islands and Southampton, bringing roadmaking and repairing material, and this boat had already brought 12,000 tons. The public safety and general purposes department had held 217 inquiries into railway accidents and five into tramway accidents. It was through that department that they had been able to arrive at a settlement on the subject of railwaymen's wages and conditions of service. Machinery had been set up to secure if possible that never again would there be such an acute controversy as threatened the safety of the realm at the time of the great railway strike. At the time when the Minister took office there was an annual loss to the State on the working of the railways of £45,000,000. The Rates Advisory Committee were asked to report as soon as possible as to raising railway rates so as to produce a financial balance. The deficit was raised to £50,000,000 by an increase of wages. The Committee advised that the raising of rates according to the standard they set forth would produce that amount. The Committee were now investigating the complicated subject of rates in detail. The Ministry was now a great organisation, and it had to be staffed with expensive heads; it required the best brains of the day. On the other hand, the rank and file of the staff were comparatively small in number. The total establishment approved was 774, and 601 had been appointed.

That the number of people employed by the Ministry of Transport is rapidly growing is shown by a comparison between Mr. Neal's statement on March 9 and the reply to a question in the House of Commons on Dec. 11 last. Sir Eric Geddes then said that the total staff employed by the Ministry of Transport was then 449. Of this number 55 were previously employed by railway companies, 14 by local authorities, 13 by engineering firms. No officers, so far as shown by the records of the Ministry, were previously employed by canal companies, by road transport contractors, or motor car manufacturers. In the departments of the Ministry which are concerned, directly or indirectly, with the internal combustion engine, 25 officers are employed who have a technical knowledge of that engine.

The following are the names and duties of each member of the staff (other than the Minister and Parliamentary Secretary) who receive a salary of £1,000 per annum and upwards:—

SECRETARIAL AND LEGAL DEPARTMENT.

Sir R. Francis Dunnell, K.C.B., secretary and solicitor; J. R. Brooke, C.B., assistant secretary; H. R. Cripps, assistant solicitor; H. E. Farror, assistant solicitor; W. B. Amery, establishment officer.

CIVIL ENGINEERING DEPARTMENT.

Sir Alexander Gibb, K.B.E., C.B., director general; J. Ferguson, M.Inst.C.E., chief civil engineer for railways and tramways; N. G. Gedye, M.Inst.C.E., chief civil engineer for docks, harbours, canals, and waterways; T. G. Menzies, C.B.E., M.Inst.C.E., chief civil engineer for special studies; G. A. Maunsell, A.M.Inst.C.E., deputy chief civil engineer for special studies.

DEVELOPMENT DEPARTMENT.

Sir Charles M. de Bartolome, K.C.M.G., C.B., director-general; G. A. Steel, C.B., assistant secretary; G. L. Colvin, C.B., C.M.G., D.S.O., director of plans branch.

FINANCE AND STATISTICS DEPARTMENT.

Sir J. George Beharrell, D.S.O., director-general; C. W. Hurcomb, O.B.E., assistant secretary; J. Milne, director of statistics section; J. Pike, director of rates section; A. T. V. Robinson, director of vote accounting section.

MECHANICAL ENGINEERING DEPARTMENT.

L. S. Simpson, C.B.E., D.S.O., chief mechanical engineer; A. S. Burnett, director locomotives and rolling stock; C. H. W. Edmonds, O.B.E., director signals and tramways.

PUBLIC SAFETY AND GENERAL PURPOSES DEPARTMENT.

Sir William F. Marwood, K.C.B., director-general; E G. Moggridge, C.B., assistant secretary; Lieut.-Colonel J. W. Pringle, R.E., chief inspecting officer of railways.

ROADS DEPARTMENT.

Sir Henry P. Maybury, K.C.M.G., C.B., director-general; J. S. Killick, M.Inst.C.E., chief engineer.

TRAFFIC DEPARTMENT.

Sir Philip A M. Nash, K.C.M.G., C.B., director-general; M. Kissane, director of storage and transit; V. M. Barrington-Ward, D.S.O., director of railway operations; J. A. A. Pickard, director of tramway and road services.

Sir John Aspinall, M.Inst.C.E., M.I.Mech.E., consulting mechanical engineer.

Traffic Census.—The Ministry of Transport has instructed all local authorities to take a census of traffic on all important roads throughout the country. On a prescribed date the census takers will be stationed every ten miles along the roads for a week, during which time very motor car, cycle, horse or other animal that passes will be counted. The object is to estimate the weight of traffic passing over each road with a view to classifying them as main roads, district roads, and other roads. The first will be maintained by the State, the second by the County Councils, and the third by the District Councils.

London Traffic Report.—Many rumours have been published recently in regard to the report that the Advisory Committee on London Traffic are drawing up. Progress has been made with the report, but all announcements with regard to it are premature, and many of them are inaccurate.

Road Transport Development.—Mr. Neal, replying to Mr. G. Doyle in the House of Commons on February 16, said that the Minister of Transport considered it desirable to leave the development of road transport to private enterprise.

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THE EDITOR will be glad to consider articles by experts. All information of a practical character relating particularly to the engineering and operating branches of transportation will receive prompt attention. Original illustrations will also be welcome.

LONDON, MARCH 18, 1920.

To Lengthen Life of Rails.

In these days it is more important than ever it was to adopt all possible means to prolong the life of the track. Renewal costs so much that in the case of undertakings which are in financial difficulties it seems almost impossible without plunging the tramway hopelessly in debt. It is not so long since the price of steel girder rails stood at £16 or £18 a ton, and that was considered exorbitant. But a week or two ago a contract was entered into by Birmingham Corporation for rails at £24 a ton, or nearly four times the pre-war price. Coupled with that is the high price for other materials and for labour, which may be put at three times the 1913 level. Tracks reconstructed at present prices must so add to capital indebtedness that no proper return can be got unless means can be adopted for largely increasing the traffic receipts. Attempts—not very hopeful we are afraid—are being made in the latter direction. In the meantime it is the task of the manager and the permanent way engineer to try to make existing tracks last as long as possible. The engineer deals with faulty joints and gets them into something like good order, but there is the wearing down of the tread of the rail till the lip on the one side and the paving on the other stand above it and the wheel flange begins to bear on the bottom of the groove. Nothing practicable for remedying this state of things except laying new rails was done until the rail remodelling process came along. This emanated from Australia a few years ago, where it has been exceedingly useful, and it has been adopted with success on various tramways in this country. The machines employed cut off high checks, deepen the groove, and grind out corrugations, with the result that a few years of additional life are given to the rail. The existence and availability of this process are at the moment emphasised by the fact that London County Council have recently given an order for the treatment of some 50 miles of track by the process. This is the first trial of it by the Council, and tramwaymen who are familiar with the process will await the result with hopeful anticipation. Turning to new and comparatively new track, there is now available the new *in situ* process for hardening the rail tread to such an extent as greatly to decrease the rate of wear. All expedients that give promise either of prevention or cure ought in these days of inflated costs to receive keener attention than ever before.

Underground Railway Finance.

It was not a cheerful picture that Lord Ashfield had to present to the annual meetings of the London underground railway companies and of the associated omnibus company. It is true that the accounts show increased revenue all round as compared with the previous year, but the cost of labour and materials has so increased as to nullify in most cases the higher revenue. The positions of the Metropolitan District Railway Company and of the London General Omnibus Company have been reversed. In the past the railway company made a comparatively poor showing in net receipts, while the omnibus company was prosperous. But last year the railway company did fairly well by comparison, while the operations of the omnibus company resulted in a heavy loss. It is true that the latter company has no capital sunk in tunnels and permanent way, but it has been hard hit not merely by increased wages, but by the enormous increase in the price of petrol, on which it depends for its motive

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power. The three other railway companies in the group struggled along in a kind of a way. The material aid which came to the District Company in the shape of the Government subsidy—this company being under State control while the tube railways are not—helped matters out all round, for after the necessary payments were made into and out of the common fund of the five companies, and the necessary adjustments made, it was found possible to pay small dividends all round, some of them, however, hardly more than nominal. Lord Ashfield showed that if all proper allowances were made the five companies on the average last year carried on their work at an actual loss of ·07d. per passenger. For the year now current, should the revenue remain at about the same amount, the prospects are still worse. The last increase in wages to the railway employees came into force only in November last, so that it is in the present year that its effects will first be fully operative. The omnibus company are now faced with another demand for an increase of wages. Lord Ashfield was thus able to put forward an unanswerable case for increased fares and for the necessity of the Bill which the underground railway companies are now promoting in Parliament to raise the fares and abolish the special privileges given to those classes of workpeople who travel before eight o'clock in the morning. The public ought to realise the reasonableness of the claim that the companies are entitled to charge such fares as will enable them to pay all expenses and have a margin over for a modest dividend for shareholders. Both Parliament and the community should the more easily appreciate the case of the companies when Lord Ashfield suggests that if desired an authority should be set up to determine what are reasonable fares to achieve the objects in view. It is perfectly clear that as expenses are still rising, there is no other way out of the difficulty than a substantial increase in fares. Otherwise the companies will be heading for bankruptcy.

Effective Publicity.

In order to show how just and well founded are the claims that the underground railway and associated companies are making, Lord Ashfield has headed an energetic publicity campaign. Not only did he make full and explicit statements at the meeting of each railway company and of the omnibus company, but at the subsequent meeting of the Underground Electric Railways Company of London he delivered a long speech giving a comprehensive view of the whole situation. In addition to that, he has addressed a gathering of London Members of Parliament, and he has given his views in the Press. Further the accounts of the companies are fuller and more explicit than before. Attention may particularly be directed to highly useful tables giving with admirable clearness the facts relating to capital, annual revenue, working expenses, dividends paid, passengers carried, fare per passenger, miles run, and other operative details which were issued as part of the report of the Underground Company. The figures relate not only to the railway companies but to the omnibus company, the tramway companies in the group, and the Associated Equipment Company. As to the magnitude of operations, they are indicated by the simple statement that last year the various companies carried in round figures 1,400 million passengers. The Underground Company, as is well known, is a holding company, deriving its revenue from shares held in the associated companies. What will be news to many people, however, is that out of a total capital of 55 millions, 32 millions is held by the public. It will thus be seen that there are great numbers of people apart from the Underground Company who are financially interested in the success of the undertakings. Lord Ashfield, in his addresses, also spoke of the need of additional underground railways for London. To provide these, and also to carry out the extensions and improvements of existing lines, a great deal of new capital is required. It is hopeless to expect people to subscribe that capital unless a fair prospect can be held out that there will be a return on it. Further, it is hopeless to expect such a return unless the revenue per passenger can be raised by charging higher fares. Those who are alarmed about higher fares checking the spreading out of the population may take comfort from noting that it is the policy of the railway companies, just as it is of the

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London County Council, to make the main increases in fares apply to the shorter journeys, and to advance as little as possible the charges for travelling to and from the outer suburbs.

L.C.C. Financial Difficulties.

The troubles of the London County Council Tramways are quite comparable with those of the underground railways. The reports presented to the Council early in March by the Highways and Finance Committees are a melancholy and convincing record of the difficulties arising from increased wages, higher cost of materials, and to some extent of omnibus competition. Neither have the estimates of revenue for the current year been reached. The Committees go into a maze of figures, but one net result in the end was to propose substantial increases of fares except for the long-distance journeys. The distance which could, under the scheme, be travelled for a penny is reduced to 1·2 miles, as against 1·5 miles at present and 1·8 miles formerly. The distances for the 2d. and 3d. fares are simply multiples of the 1·2. Workmen's fares it was proposed should be raised correspondingly, so as to run from 1d. to 3d. with no advantage on returns. These changes, however, would not have been sufficient to wipe out the estimated deficit for the year 1920-21 of £760,000; indeed, the revenue account would still have been £601,000 to the bad. Accordingly it was also proposed that application should be made to the Ministry of Transport under the Statutory Undertakings (Temporary Increase of Charges) Act for sanction to increase the statutory maximum fare of 1d. a mile up to a limit of 50 per cent. This procedure has been carried out by several provincial tramways, and there is, of course, the precedent of the railways of the country (except certain lines in London) whose fares have been raised by 50 per cent. The last proposal was that by the Finance Committee, namely, that provision for the repayment of the outstanding debt on the Council's tramways should be made on the accumulative annuity system (3½ per cent. table), instead of on the instalment system, as at present, and that for 12 years half the cost of renewals of tramway track be charged to capital account, repayable within 12 years. This would reduce the debt charges over that period by over a million sterling. The minority —and it was a large one—did not show much wisdom or common sense when the proposals for increased fares came before the Council on March 9. In the first place, they succeeded in keeping the Council sitting all night, but they failed to prevent the majority from carrying the recommendation for the increase of fares. The minority, consisting mainly of the Labour and the so-called Progressive elements, were no doubt playing to the gallery, having their eyes all the time on the multitudinous London working man who objects to pay more for tramway rides even if the undertaking is to be carried on at a loss. It was indeed remarkable that the minority should think it a good argument to say that the enormous deficit expected on the tramways can be prevented by a revision of services and greater efficiency. Apparently this was the only material argument, apart from the old one that the undertaking is unduly burdened by capital charges which it should not be called on to bear. These county councillors apparently know more about tramway management than the experts who manage the undertaking do, and more also than the financial advisers who back up the technical experts. The case made for the increases was so good that it was carried, with a sop to Cerberus thrown in in the shape of an undertaking that a special inquiry should be made into the whole question. The Highways Committee having got a part of their proposals agreed to postpone the application to the Ministry of Transport for authority to charge fares to the extent of 50 per cent. above the statutory maxima. No doubt that will have to come sooner or later.

LONDON TRAFFIC CONTROL.

Mr. Neal, Parliamentary secretary to the Ministry of Transport, replying to questions in the House of Commons, on March 1, said that the Select Committee on Transport (Metropolitan Area) had drawn attention to the need of the better control of slow-moving traffic. The question had been under the consideration of the Advisory Committee on London Traffic and the Technical Committee, and an experiment was now being carried out on two thoroughfares in the City and West End of London where there is a great volume of slow moving traffic.

The reports from the Commissioners of Police of the City and Metropolitan area indicated that the alterations in the stopping places of omnibuses and tramway cars adopted on the recommendation of the Advisory Committee had in general greatly facilitated the movement of traffic. No experiment in one-way traffic in the most important arteries of traffic had been carried out, but the question would be referred to the Advisory Committee.

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TRAMWAYS FINANCE: STATUTORY FARES.

A MEMORANDUM SUBMITTED TO THE EXECUTIVE COUNCIL OF THE MUNICIPAL TRAMWAYS ASSOCIATION (INCORPORATED) BY A COMMITTEE OF THE ASSOCIATION.

(1) DATA FOR COMPARISON OF RESULTS OF YEARS 1913-14 AND 1918-19.

Almost all the members of the Association have now revised the returns made in May, 1919, upon this question, and have furnished (*inter alia*) the data necessary for a comparison of the actual results of operating tramways for the financial years 1913-14 and 1918-19.

(2) EFFECT OF LAST WAGES AWARD.

In addition to tabulating the figures necessary for this purpose, estimates of the income and expenditure for 1919-20 have been supplied in a number of cases, but inasmuch as some of them are more or less incomplete, they are of little practical importance for the purpose of this inquiry.

For example, some members have made estimates of the annual contribution that ought to be made for renewals during the current quinquennium, but in most cases they have not used these estimates in the tramways budget for the current year. An examination of such estimates discloses the fact that the result of doing so would have given prominence in many cases to an adverse balance.

It must be borne in mind that the last increase in wages under the award of the Interim Court of Arbitration of October last operates during a complete half of the current financial year, viz., from the 1st October, 1919, and the additional charge thereby imposed will have an important and serious bearing upon the finances of tramways for the current year.

(3) RENEWALS AND PROVISION THEREFOR.

This question of renewals and provision therefor deserves the special consideration of the Association, as it involves a matter of principle of the first importance affecting tramways finance in general.

Let it be assumed that the whole of the debt incurred in the construction of the permanent way has been paid off, then there is nothing in commercial finance, or in either the principles or practice of accountancy, against borrowing for the replacement of the permanent way, and repaying the loan within its useful life. This principle is commonly applied in the case of electricity plant. The present practice of tramways authorities of providing not only for debt redemption compulsorily, but concurrently therewith, and in most cases voluntarily, for the renewal and restoration of the permanent way obviously imposes a double burden upon municipal tramway undertakings. Whether the single charge—for debt redemption only—in cases where the duration of the sinking fund is not longer than the effective life of the track should commend itself to tramways authorities in general, especially in view of the permanent change in values, and the manifest hostility of the public towards increased charges for tramways facilities (almost alone amongst all public services) is one for careful consideration.

It is significant of the spirit of the times that, according to Press reports, only recently a body of teachers in London has passed resolutions protesting against increases in fares for transport services without apparently giving any consideration to, or examining into the main cause that has made such increases urgent and necessary, namely, increases in wages, and this is not the less striking because it follows upon very substantial increases of their own salaries, plus a materially improved pension scheme which operates from April 1, 1919, upon a non-contributory basis.

(4) EVIDENCE IN FAVOUR OF INCREASED MAXIMUM FARES.

No fewer than 40 members express their willingness to give evidence in favour of higher authorised fares, several of them as respects workmen's fares only. In one case in favour of increased fares for Sundays and Bank Holidays, because of higher wages paid on those days. One authority is content to leave the question in the hands of the Association. It is suggested in one case that where the lessors' consent to increased charges is now required, such consent should not be necessary to the operating authority, and the necessity for it should be abrogated.

(5) RATE-AIDED UNDERTAKINGS, 1919-20.

From the following statement the striking fact emerges that over 20 per cent. of the municipally-owned tramways in Great Britain are not only not self-supporting this year, but are a charge upon local rates in order to pay their way.

The position is all the more serious by reason of the fact that adequate provision for replacement of wasting assets is not being made. This deplorable state of affairs exists side by side with conditions of prosperity in the great industries of the country, which are unexampled in commercial history.

It is true that there has been a progressive increase in revenue common to almost all undertakings, but the increase in the operating costs has been 20 per cent. higher, on the average, than the increased revenue.

Here and there may be observed indications of improvident finance. For example, notwithstanding the great increase in the cost of repairs and renewals yet to be effected, several authorities are in fact withdrawing sums from renewals funds, which are already inadequate, in order to reduce the rates. Such a course is clearly indefensible in the present circumstances.

The following 22 municipal authorities are providing subventions from local rates to the extent of £103,221 in the aggregate, in respect of 20 undertakings, during the current year, involving rates varying from nearly 10d. in West Ham to about three-fifths of a penny in Warrington, viz.—

ENGLAND AND WALES.

YEAR 1919-1920.	Amount Imposed on Local Rates.	Amount Produced by 1d. Rate.*	Approximate Amount of Rate in £.
West Ham	£50,327	£5,110	9·85d.
East Ham	11,474	2,121	5·41d.
St. Helens	8,020	1,500	5·35d.
Mossley (J)	1,000	225	4·44d.
Gloucester	3,760	890	4·22d.
Yarmouth	3,500	880	3·99d.
Widnes (M)	2,494	630	3·96d.
Colne	1,420	400	3·55d.
Rawtenstall	1,500	484	3·10d.
Lowestoft	1,500	510	2·94d.
West Bromwich (M)	2,000	780	2·56d.
Ipswich	3,422	1,352	2·53d.
Stalybridge (J)	1,000	460	2·17d.
Darwen	1,332	639	2·08d.
Hyde (J)	1,000	534	1·87d.
Lancaster (M)	1,459	780	1·87d.
Nelson	1,331	747	1·78d.
Northampton	2,447	1,628	1·50d.
Bootle	2,395	1,659	1·44d.
Bacup	273	324	·84d.
Dewsbury	867	1,078	·80d.
Warrington (M)	700	1,120	·62d.
	£103,221		

J Represents Joint Board. M Motor omnibuses. * General district rates basis.

(6) RATE-AID FOR TRAMWAYS.

It is not the purpose of this memorandum to consider the question of contributions to rate funds from tramways, but attention is directed to the fact that many authorities that have customarily so contributed to the cost of local government from tramways, and thereby reduced the rates by this form of indirect local taxation, have been compelled either to reduce or to abolish such rate aid. The following are examples—

	For 1913-14.	For 1918-19.
(1) Belfast	£2,905	—
(2) Birmingham	44,972	£15,000
(3) Bradford	17,200	—
(4) Cardiff	9,600	—
(5) Glasgow (Common Good) ...	53,892	14,773
(6) Hull	7,000	—
(7) Plymouth	4,037	—
(8) Rochdale	3,490	—
(9) Sheffield	30,582	9,228
(10) Southend-on-Sea	7,000	3,500
(11) Stockport	12,250	—
	£192,928	£42,501
Less	42,501	
	£150,427	

The above-named eleven undertakings show a reduction of available contributions to rate funds during the war of £150,427, and this has resulted in a corresponding increase in local rates.

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It is noteworthy that in some instances the surpluses which were formerly devoted to rate-aid have been appropriated to the renewals funds in recent years.

On the other hand, there are many cases of increases in rate relief from tramways. The following are examples—

	In 1913-14	In 1918-19
(1) Birkenhead	—	£2,850
(2) Blackpool	£10,000	15,000
(3) Bournemouth	—	6,000
(4) Brighton	—	5,000
(5) Croydon	—	*12,554
(6) Huddersfield	6,662	7.050
(7) Leeds	70,005	90,000
(8) Manchester	103,090	111,891
(9) Newcastle-on-Tyne	13,469	15,385
(10) Nottingham...	24,000	30,000
(11) Salford	22,000	25,000*
(12) Southampton	2,360	8,000
(13) South Shields	1,700	3,676
(14) Wallasey	7,750	12,000
(15) Walsall	2,000	5,000
(16) Wolverhampton	5,188	8,390
Totals	£268,224	£357,796

*This is the whole of the surplus revenue, but £14,000 was applied in rate-aid.

(7) TRAMWAYS AND LOCAL RATES, 1913-14 AND 1919-20.

The following is a comparison of the sums actually included in the estimates for rates by 30 municipalities in 1913-14 and 1919-20, as contributions from tramways in reduction of rates.

It is to be borne in mind that some authorities apply the profits to the rates in the year in which they are earned; others apply them in the succeeding year.

	1913-14	1919-20	
	£	£	
(1) Ashton-under-Lyne ...	3,050	2,690	— 360
(2) Belfast	15,000	8,960	— 6,040
(3) Birmingham	57,577	15,000	— 42,577
(4) Blackpool	8,000	20,000	+ 12,000
(5) Bolton	17,000	15,500	— 1,500
(6) Bradford	17,200	30,000	+ 12,800
(7) Bury	5,000	3,500	— 1,500
(8) Cardiff	9,400	5,000	— 4,400
(9) Croydon	3,000	14,000	+ 11,000
(10) Dundee (Common Good)	1,000	1,000	—
(11) Glasgow	53,892	14,773	— 39,119
(12) Halifax	6,033	10,445	+ 4,412
(13) Huddersfield	6,590	7,050	+ 460
(14) Leeds	66,000	90,000	+ 24,000
(15) Liverpool	66,929	140,000	+ 73,071
(16) Manchester	103,117	111,890	+ 8,773
(17) Newcastle	12,000	14,000	+ 2,000
(18) Nottingham	19,000	18,094	— 906
(19) Preston	1,300	5,000	+ 3,700
(20) Salford	22,000	20,000	— 2,000
(21) Sheffield	26,058	27,000	+ 942
(22) Southampton	2,360	8,000	+ 5,640
(23) Southend-on-Sea ...	4,700	5,000	+ 300
(24) South Shields	1,600	3,620	+ 2,020
(25) Sunderland	5,000	5,000	—
(26) Swansea	3,000	1,000	— 2,000
(27) Wallasey	7,750	14,000	+ 6,250
(28) Walsall	2,000	5,000	+ 3,000
(29) Warrington	1,500	3,000	+ 1,500
(30) Wolverhampton ...	3,777	10,000	+ 6,223
Totals	£550,833	£628,522	
		550,833	
Net estimated increase		£77,389	

It is now manifest, after ten months of the year have expired, that many of the authorities included in this list will not be able to provide out of the earnings of the current year the amounts named. Some of them will actually incur a deficit.

(8) GROSS AND NET PROFITS OF 86 UNDERTAKINGS.

From the completed financial returns that have been analysed of 86 undertakings, the following summaries have been prepared—

	1913-14
(1) The total revenue was	£10,926,301
(2) Less total operating expenses	7,097,945
(3) Leaving the gross profit of	3,828,356

	1918-19
(1) The total revenue was	£17,595,521
(2) Less total operating expenses	12,891,258
(3) Leaving the gross profit of	4,704,263
The increase in the total revenue was	61·04%
The increase in the operating expenses was	81·60%

These 86 undertakings show the following results after all the obligatory charges (such as service and redemption of debt, income-tax, etc.) have been met, but before providing for renewals—

In 1913-14—Surplus	£1,161,134
In 1918-19—Surplus	1,448,763
An increase of	287,629

For the current year the additions to wages under the award of October, 1919, will cost these undertakings a further sum of round about £350,000, apart altogether from the wages of additional employees consequent upon the agreement of March, 1919.

The additions to the wages bill consequent upon the award absorb the increase in net revenue shown above, and leave a substantial deficit, without anything for renewals.

(9) PROGRESSIVE DIFFICULTIES.

The result is for the year ended March 31, 1919, but the adverse conditions have changed enormously for the worse since then. The figures for the current year will not sufficiently disclose the true position, but they will serve to stress the course of events. In all the undertakings the all-in costs of operation have risen in a greater ratio to the increase in revenue, than the foregoing figures show.

Recent tests bring out the fact that the undertakings that have been hitherto the most successful are now being carried on at an actual loss, in spite of the fact that the earnings per car-mile are inflated by overcrowding of cars—a condition of affairs which the public will not tolerate indefinitely.

We venture to lay it down as axiomatic that the tramways service should be self-supporting, and that the ratepayers should not be called upon to subsidise out of a compulsory local rate what is in fact a great commercial enterprise. Not only should both ends meet, but there should be some surplus annually for emergencies.

The present and prospective financial condition of the industry demand urgent and serious attention.

(10) FACTORS IN THE PRESENT POSITION.

One outstanding feature of the returns is the absence of uniformity in either local conditions or the methods of appropriating any available surplus revenue. Another is the fact that in many cases the maximum period fixed for the redemption of the debt incurred for some of the assets is longer than their useful life, and the result of this is that debt charges that ought to be met annually now are being handed on to subsequent years. Another is that during the war considerable sums have been paid by way of patriotic payments to men who have been serving with the colours, and who, during that period, have not rendered any service directly to the undertakings from which such payments have been made. These payments have been discontinued as the men have returned to civil life. The sums so released have been absorbed in increased operating costs.

Another factor to be considered for the immediate future will be the increase in the annual charges for borrowed money in every case financed by means of short-term loans. The new Exchequer Bonds will yield 5¾ per cent. per annum. Several large authorities are now advertising at 5½ per cent., and some of them are paying higher rates, whilst one municipality is seeking authority in the next session of Parliament to issue stock at 6 per cent. if necessary, which is the highest figure on record.

The one feature common to them all is the admitted inadequacy of the sums now being set aside to meet the cost of future renewals, assuming that the present users of tramways should be called upon to provide travelling facilities for subsequent years, by means of replacements at a cost much higher than the construction of existing tramways systems has entailed.

Most important of all is this—if proper provision is to be made for renewals, then almost every undertaking will show a substantial loss at the present time, and will be compelled to carry on either by consuming its capital—a process that cannot continue—or to obtain additional revenue by means of increased charges, or to fall back upon rate-aid.

(11) INCREASE IN FARES IN 1919.

The following 34 authorities raised the fares during 1919 or since. Some of them are yet below the statutory maximum authorised. The statutory maximum is, however, one thing; the economic maximum is the ultimate test.

Aberdare	Edinburgh	Northampton	Stalybridge, etc.
Birkenhead	Gloucester	Oldham	Stockport
Brighton	Halifax	Reading	Walsall
Burton-on-Trent	Hull	Rochdale	Walthamstow
Chester	Ipswich	Rotherham	Wolverhampton
Chesterfield	Lancaster	Sheffield	West Ham
Coventry	Leyton	Southampton	Wigan
Colchester	Leith	St. Helens	Yarmouth
Dundee	Lowestoft		

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In Schedule 3 will be found a list of the authorities that have obtained orders to increase fares under the Statutory Undertakings (Temporary Increase of Charges) Act, 1918.

(12) STATUTORY FARES.

The precise classification of the answers to the questions of existing fares in relation to the maxima authorised is not free from difficulty, and must be submitted with slight reservations. In some cases the maximum is charged on some routes only. In others the distances fall somewhat short of a mile, and so on, and are therefore capable of minor adjustments only. In such instances they are classed as maximum.

For 82 undertakings they may be tabulated thus—

FOR ORDINARY PASSENGERS—	
Now at maximum (see Schedule I.) ...	37
Less than maximum	45
FOR WORKMEN'S FARES—	
Now at maximum (see Schedule II.) ...	56
Less than maximum	26

(13) NECESSITY FOR IMMEDIATE ACTION.

We are of opinion, in view of the attitude of the public towards increased fares on one hand, and the pressing and progressive necessity of tramways authorities for restoring their financial equilibrium on the other, that the time is ripe for a frank and full statement on the present position and prospects, and for an appeal to the common sense of the community to support a general upward movement in tramway fares, on the ground that local authorities must maintain their solvency in a branch of the public service which is essentially commercial. The rider should at least pay the actual cost of his ride.

G. W. HOLFORD,
J. M. McELROY,
J. BECKETT,
General Secretary.

Temporary Offices—
Gothic House, Accrington,
February 4, 1920.

SCHEDULE I.

ORDINARY PASSENGER FARES.

List of authorities now charging the maximum fares.

* Minimum authorised fare 2d.

(1) Aberdare*.
(2) Accrington.
(3) Ashton-u-Lyne.*
(4) Belfast (*a*).
(5) Blackburn (*b*).
(6) Bradford (*c*).
(7) Bury.
(8) Cardiff (*d*)*.
(9) Chester (*e*)*.
(10) Colne.
(11) Darwen.
(12) Doncaster.
(13) Dover.
(14) Erith.
(15) Gloucester (*f*).
(16) Halifax.
(17) Ilford.
(18) Ipswich (*g*).
(19) Kilmarnock (*g*).
(20) Kirkcaldy (*f*).
(21) Leith (*g*).
(22) Maidstone.
(23) Nelson.
(24) Northampton(*f*)*
(25) Oldham (*h*).
(26) Rawtenstall (*g*).
(27) Reading (*f*).
(28) Rochdale (*g*).
(29) Rotherham.*
(30) Southend-on-Sea.
(31) Southport.
(32) Stalybridge, etc.
(33) Stockport.*
(34) Walthamstow.*
(35) Wigan.*
(36) Yarmouth.*
(37) York.

(*a*) A little below statutory fare. (*b*) On one section. (*c*) In some cases. (*d*) Just under the limit. (*e*) Yes, as regards rate per mile, but not minimum of 2d. (*f*) Practically. (*g*) Increased under Act of 1918. (*h*) Practically, but have power to charge not less than 3d. for any distance less than three miles.

SCHEDULE II.

WORKMEN'S FARES.

Authorities now charging the maximum fares.

† Minimum authorised fare, 1d.

(1) Aberdare.†
(2) Accrington.
(3) Ashton-u-Lyne.
(4) Ayr.
(5) Belfast.
(6) Birkenhead.
(8) Bolton.†
(9) Bournemouth.
(10) Bradford (*a*).
(11) Burnley.†
(12) Bury.
(13) Cardiff (*b*).†
(14) Chester.†
(15) Colchester.
(16) Colne.†
(17) Darlington.
(18) Darwen.
(19) Doncaster.
(20) Dover.†
(21) Erith.†
(22) Gloucester.
(23) Halifax.†
(24) Huddersfield.
(25) Ilford.
(26) Ipswich (*c*).†
(27) Kilmarnock.
(28) Kirkcaldy.
(29) Lancaster.
(30) Leith (*c*).
(31) London County Council (*d*).
(32) Maidstone.
(33) Manchester.†
(34) Nelson.†
(35) Newport.†
(36) Northampton.
(37) Oldham (*d*).
(38) Plymouth (*e*).
(39) Preston.
(40) Rawtenstall (*c*).
(41) Reading (*d*).†
(42) Rochdale (*c*).
(43) Rotherham.
(44) Salford.
(45) Sheffield (*a*).†
(46) Southend-on-Sea.
(47) Southport.
(48) Stalybridge, etc., Board.
(49) Stockport.
(50) St. Helens.†
(51) Walthamstow.
(52) West Ham.†
(53) Wigan.
(54) Wol'hampton (*d*).
(55) Yarmouth.
(56) York.

(*a*) In some cases. (*b*) Just under the limit. (*c*) Increased under Act of 1918. (*d*) Practically. (*e*) On some routes only.

SCHEDULE No. III.

LIST OF ORDERS ISSUED UNDER ACT OF 1918.

Statutory Undertakings (Temporary Increase of Charges) Act. 1918.

NAME OF UNDERTAKING.	DATE OF ORDER.
	1918.
Neath Corporation	5 December.
London United Tramways, Limited ...	16 ,,
York Corporation Light Railways ...	16 ,,
	1919.
Rawtenstall Corporation	25 February.
Portobello and Musselburgh Company ...	28 ,,
Rochdale Corporation	24 March.
London United Tramways, Limited ...	2 April.
Edinburgh Corporation	14 ,,
Bath Electric Tramways Company ...	14 ,,
Great Orme Tramways Company ...	15 ,,
Swindon Corporation	1 May.
York Corporation Light Railways ...	16 June.
Edinburgh Corporation	30 ,,
Cork Tramways Company	8 August.
Coventry Corporation	9 ,,
Gloucester Corporation Light Railways ...	8 September.
Hastings Tramways Company	28 October.
Paisley District Company	3 November.
Ipswich Corporation	1 December
South Lancashire Tramways Company ...	15 ,,
Edinburgh Corporation	29 ,,
	1920.
Luton Corporation (Lessee) Company ...	6 January.
Leith Corporation	7 ,,
Rhondda Tramways Company	13 ,,

[The report given above appeared in THE TRAMWAY AND RAILWAY WORLD of February 21 (now out of print), and in view of its importance to the industry both at home and abroad it is here reprinted in full.]

THE RAILWAY ADVISORY COMMITTEE.

The Ministry of Transport issued the following announcement at the end of February—The Railway Advisory Committee appointed by the Minister of Transport to advise him upon all such matters falling within the powers conferred upon him by the Ministry of Transport Act, 1919, as he may refer to them, held its first meeting on Wednesday, February 25.

The Minister of Transport (Sir Eric Geddes) took the chair, and the following members were present—

Mr. C. Aldington, C.B.E.	Mr. F. Tatlow, C.B.E.
Mr. J. Bromley.	Rt. Hon. J. H. Thomas, M.P.
Sir Alexander Kaye-Butterworth.	Sir Henry Thornton, K.B.E.
Mr. C. T. Cramp.	Mr. A. G. Walkden.
Mr. C. H. Dent.	Sir Herbert Walker, K.C.B.
Sir Sam Fay.	Mr. Arthur Watson, C.B.E.
Sir William Forbes.	Sir Thomas Williams.
Mr. D. A. Matheson.	

It was decided by the Committee that no statement as to their discussions should be published. Future meetings of the Committee will be held as required by the amount of business.

THE RULE OF THE ROAD.

DANGER OF OMNIBUSES AND TRAMCARS USING THE SAME STOPPING PLACES.

Lambeth Borough Council are urging upon the Chief Commissioner of the Metropolitan Police the necessity of taking adequate steps to prevent omnibuses using the same stopping places as those fixed for tramcars, because—

(i.) It is highly dangerous to life and limb that the omnibuses are allowed to rush up while the passengers are entering or alighting from the cars; moreover, it is a nuisance to people waiting for the trams to have mud and slush splashed all over their garments.

(ii.) Owing to their congested state, our roads are made impassable to other traffic while the omnibuses are pulled up alongside the trams.

The Council also ask the Chief Commissioner of Police to issue an order, for the better protection of the public, that no vehicle, motor, steam, horse or man power, shall pass a tramcar on the near side when the said car is picking up or setting down a passenger or passengers.

ACTION AT MANCHESTER.

At a meeting of the Manchester City Council, Alderman Ashton moved a resolution that when a tramcar is halting at a tramway stopping place, the driver of every vehicle who intends to pass on the left or near side shall stop before arriving at such point until the roadway is clear of passengers entering or leaving the car. Alderman Ashton spoke of the recklessness of impudent motor drivers, who drove their cars irrespective of passengers. The matter was referred to the Town Clerk to make inquiries.

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TRAMWAY WORKERS' WAGES.

EMPLOYERS FAVOUR INCREASE ACCOMPANIED BY HIGHER FARES.

A special meeting of the Municipal Tramways Association was held at the Surveyors' Institute, Great George Street, S.W., on February 25, to consider what action should be taken in view of the demands of the employees which were to be considered by the Joint Industrial Council on the following day. The meeting was largely attended, representatives being present from almost all municipal tramways in the country. The proceedings were private, but it is understood that the meeting authorised the executive council to deal with the matter. A meeting of representatives of tramway and light railway companies was also held, and later the representatives of the two associations had a conference.

The Joint Industrial Council for the tramways industry met at the Ministry of Labour on February 26, to consider the application of the National Transport Workers' Federation for an advance in the wages of the tramways workers throughout the country. The application was for an addition such as would bring the total earnings up to 44s. above pre-war rates, with 5s. per week for those under the age of 18. After the conference Mr. R. Williams stated that the employers' representatives had asked for an adjournment of a fortnight until further facts had been elicited regarding the increases in comparable industries and the agreed statistics relating to the increases in the cost of living and the financial position of the municipal and privately-owned tramway undertakings. A committee of ten, five representing the employers and five the employees, was appointed to make the necessary investigations, and to report to the Joint Council at a meeting to be held on March 11.

At the resumed sitting on March 11, the Council received the report of the committee appointed on February 26. There was a long discussion but no definite agreement was reached. The employers, although satisfied that a case has been made out for some advance, were of opinion that the question as to the amount should not be determined until the Prime Minister had promised that the Government would take steps to enable tramway undertakings to meet their obligations by an increase in fares. It was decided to lay the case before the Minister of Labour, and the deputation was duly received at Montague House on March 12, by Sir Robert Horne, who, after hearing representatives of both sides, referred the deputation to the Ministry of Transport. The council was then received by Sir W. Marwood, of the Ministry of Transport (with whom was Sir G. Beharrell), who promised that an immediate inquiry would be made into the conditions of the tramways industry.

ARBITRATION IN ROAD TRANSPORT DISPUTE.

On March 9 the Joint Industrial Council for the road transport industry agreed to refer the workers' claim for a 10s. advance in wages to the Industrial Court for arbitration. This decision was reached after joint and separate meetings of the two parties, and after the Minister of Labour had been consulted.

According to a statement made by Mr. R. Williams, general secretary of the Transport Workers' Federation, the Council also resolved to request the Ministry of Labour to summon to attend the arbitration proceedings not only the constituent parts of the Joint Industrial Council, but all federated and non-federated employers' associations and individual employers in receipt of the claim made by the Transport Workers' Federation. The hearing will probably take place on March 24.

AWARD TO KILMARNOCK TRAMWAY EMPLOYEES.

The award of the Industrial Court in the arbitration between the workers' union and the Kilmarnock Corporation Tramways Department is as follows :—

(153) Kilmarnock Corporation (Tramways Department).

Parties :—The Workers' Union and the Kilmarnock Corporation (Tramways Department).

Terms of Reference.—Claim by the Union on behalf of their members employed by the Kilmarnock Corporation (Tramways Department) for an advance of 4s. per week in the case of those employees 18 years of age and over, and 2s. per week in the case of those under 18, as from the beginning of the first pay period following 1st October, 1919.

(1) The matter was referred under the Industrial Courts Act, 1919, by the Ministry of Labour to the Industrial Court for settlement, and representatives of the parties were heard at Glasgow on February 5, 1920.

(2) The tramway undertaking of the Corporation began to be operated in or about the year 1904, and has never been carried on at a profit. During the five years from 1915 to 1919 inclusive, the average deficit was about £3,000 per annum. The track is about four miles long.

(3) An increase in fares as from January 1, 1920, showed an increase in revenue for the month of approximately £35 on the monthly revenue, which was stated to average approximately £1,250, and a decrease in passengers carried of about 12 per cent.

(4) The men concerned have received by way of war advances 30s. per week.

(5) The attention of the Court was directed to the rating limit prescribed by Section 13 of the Police Act, 1919, and to the limitations imposed on the borrowing powers of the Corporation for tramway purposes contained in the Kilmarnock Corporation Order Confirmation Act, 1904.

(6) The Court have given careful consideration to the arguments and evidence submitted, and their decision in full satisfaction of the claim submitted, is that the workpeople concerned aged 18 years and over shall receive an advance of 2s. per full ordinary week, and that this advance shall take effect as from the beginning of the first pay period following January 1, 1920.

WILLIAM W. MACKENZIE.
G. T. REID, Secretary, JAMES FULLERTON.
5, Old Palace Yard, D. C. CUMMINGS.
S.W.1., February 20, 1920.

BRITISH STANDARD SPECIAL TRACKWORK FOR TRAMWAYS.

A report on British Standard Special Trackwork for Tramways has been issued by the British Engineering Standards Association, of 28, Victoria Street, London, S.W. (price, 1s. 2d. postage included). The report, which is accompanied with numerous diagrams and tables illustrating standard nomenclature, is substantially as follows—

Nomenclature.—The nomenclature used for different classes of special trackwork for tramways has hitherto been somewhat confused, and the association has accordingly prepared diagrams illustrating practically every type of point, crossing, and layout used in actual practice, with suitable standard titles.

Crossing and Standard Method of Measuring Angles.—Considerable confusion has in the past arisen when only the angle and overall length of crossings has been specified, as no uniform method of measuring the angle or proportioning the respective lengths of the legs has been recognised. A table shows the standard now recommended in this respect, and the length of legs given allow sufficient room for the insertion of the fishplates with their bolts. The grooves should be gradually raised to ¼ inch deep at intersection.

Switches.—Standard lateral and equilateral switches are also shown in tables. The overall lengths, distance between tangent line and toe of switch, and offsets of the different switches are shown for the different radii. The length of tongue and the maximum width of groove measured in the tongue recess are also given.

Crossovers and Turnouts.—Tables given also show standard crossovers and lateral and equilateral turnouts, which would be built up from the standard switches and crossings recommended as applied to the British standard rail gauge of 4 ft. 8½ in.

Easement Curves.—The question of standardising easement curves has been most carefully considered, and the association is of the opinion that the time has not yet arrived when a satisfactory series of spiral curves can be recommended for universal adoption. The conditions of the roads in this country are such that in laying out special trackwork it is necessary almost constantly to modify standard easement curves even when as many as four different standards are used.

Holes for Bonding, Fishing, etc.—The association considers that only external bonds should be used for special trackwork, and that the British standard bond hole drilling is satisfactory.

INSTITUTE OF TRANSPORT.

The second meeting of the Council of the Institute of Transport was held on March 5, General Sir H. Maybury presiding in the unavoidable absence of the chairman, Lord Ashfield. Owing to the indisposition of the president, the inaugural meeting, which was to have taken place on March 15, has been postponed until March 22. The meeting will be held at the Institute of Civil Engineers, Great George Street, Westminster, S.W., when Sir Eric Geddes will deliver his presidential address.

A series of meetings is being arranged for the current session, at which papers bearing on transportation subjects will be read by prominent authorities. Arrangements for meetings of graduates and students will also be made. It has been decided that foundation members shall comprise members or graduate members elected up to the date of the inaugural meeting. Consideration is being given to a generous scheme for the award of premiums and medals for contributions to the proceedings and for papers by graduates and students.

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INCREASED FARES.

ST. HELENS.—The Tramways Committee are seeking powers to increase workmen's fares from ½d. to 1d. per mile.

LEITH.—The Town Council have adopted the new scale of fares, and it came into force on February 15. The stages have been considerably shortened. There will be a universal penny fare for workmen, a penny being charged for the whole or part of a route.

ABERDEEN.—The Tramways Committee have unanimously decided to make no change in the fares for the current year. The proposal to raise the fares was recently discussed but the committee decided that it was premature. During the last few months the revenue has greatly exceeded the estimates.

LIVERPOOL.—The estimates for the current year are to be considered by the Liverpool Tramways Committee in about three weeks' time, when it is expected that the necessity for a further increase in fares will be revived. At a special meeting of the committee on February 13 the report of the city engineer and the tramway manager was presented, and in view of its importance it was decided to defer the subject for three weeks. The estimates will, of course, be much higher than a year ago. There will be within a short time considerable advances in the present fares. The greatly increased cost of operation and the enhanced prices of all materials required for renewals and repairs are rendering the present fares impracticable.

ASHTON-UNDER-LYNE.—The Tramways Committee decided to increase the fares at the beginning of March. All penny stages, with the exception of three short lengths to the borough boundary will be abolished and the minimum fare fixed at 1½d. A revision is being made in the conditions of the issue of workmen's tickets and these will not be available after 8 a.m. Ashton Town Council propose to revise the tramway fares on the present system and also on the Oldham and Ashton tramways which the Council is about to acquire. Alderman Oldham said that the revision of fares was the only way out of their financial difficulties. He estimated that to construct a mile of single track at the present time cost £12,000, against £4 000 before the war.

LONDON.—About 400 delegates, representing some 200 trade unions, co-operative societies and labour bodies, met in London on February 7, and protested against the abolition of workmen's trains and fares, and the proposed increase of ordinary fares on the London tubes, the District Railway and associated tramways. Mr. H. H. Gordon, of the London County Council, said there was no city in the world where traffic was so badly organised or where it was in such a chaotic state as in London, and to remedy it they must municipalise local transit in the same way as they must nationalise through transit for the benefit of the country at large. Mr. J. H. Thomas, M P., in a speech at Leyton on February 8, said that he was satisfied there was no money in the Underground group to meet the just demands of the railway employees, and the only way to raise money was by increasing the fares. The National Union of Railwaymen would not be a party to giving cheap travelling facilities to the public at the expense of sweated railway men.

LEEDS.—At a meeting of the Leeds Tramways Committee on February 16, the question of fares was considered. A statement was submitted showing that with the present fares the undertaking is not paying its way, and it was suggested that the standard fare in future should be 1d. per mile. The principle that has guided the policy of the Corporation has been that a municipal trading concern should earn a reasonable profit for the relief of the ratepayers, whose credit stands behind the finances of the concern, and it is regarded as inevitable that the huge burden which has fallen on the undertaking owing to the increase in wages will have to be passed on to the public. In the last completed financial year the tramways contributed £90,000 to the relief of the rates, and the estimates for the current year ending March 31 next provided for a surplus of a like amount, but it is now certain that the expectation cannot be realised. The reduction in the hours of work during the year from 54 to 48 without reduction of wages has entailed an increase of over 10 per cent. in the wages bill. In October there was a further increase of 4s. a week in the wages, and taken in conjunction with the reduction of hours in July, this increase has had the effect that each man in the tramways department has for a considerable part of the year been in receipt of from 14s. to 15s. a week more than was anticipated when the estimates were prepared. On the whole year there has been an added expense for wages of £162,000. While increased fares have partly met this burden they fall a long way short of balancing the account. As the undertaking is now faced with a further demand from the Transport Workers' Federation, the outlook is still more disquieting.

NEWCASTLE, which has been almost alone among the larger tramway undertakings in the country in retaining its pre-war fares, has been at length compelled to decide upon an increase. The Tramways Committee has recommended the City Council to revise the existing fare stages on the basis of a journey of one mile for 1d., two miles for 1½d., and three miles 2d., with overlapping fare stages. They also propose the following changes—The abolition of existing ½d. fare stages with the exception of that from the Central Railway Station to the foot of Northumberland Street ; revision of workmen's fares on the basis of two one-mile stages for a 1d. coupon ; four 1-mile stages for a 1½d. coupon ; and six 1-mile stages for a 2d. coupon ; limitation of the workmen's dinner-hour coupons to a single 1-mile stage ; and the discontinuance of the present concession of 40 per cent. allowed in respect of postmen's tokens. A request will be made to the Watch Committee and the Standing Joint Committee of Northumberland to pay a compounded sum in respect of the fares of police officers in uniform travelling on Corporation cars ; the issue of travelling coupons to tramway employees at the car sheds will be discontinued, and children's fares will be fixed at ½d. for the first 1-mile stage and 1d. for three 1-mile stages. It is not proposed to alter existing arrangements enabling blind persons to travel at half fare.

FINANCIAL REPORTS AND MEETINGS.

BOLCKOW, VAUGHAN AND COMPANY.—An interim dividend is announced at the rate of 4 per cent., less tax, on the ordinary shares. The dividend was the same a year ago.

BRUCE, PEEBLES AND COMPANY, LIMITED. — A dividend is announced at the rate of 7½ per cent. per annum, less tax, on the ordinary shares for the year ended March 31.

ABERDEEN SUBURBAN TRAMWAY for the half-year ended January 31 shows a profit of £2,550, making, with the sum brought forward, £4,456 at the credit of the profit and loss account.

BRITISH ALUMINIUM COMPANY, LIMITED.—The directors have decided to make a distribution out of reserves by means of the issue of two fully-paid ordinary shares for every three ordinary shares now held.

WARRINGTON TRAMWAYS.—The annual report of the tramways of the County Borough of Warrington shows that the expenditure for the year was £26,882, as compared with £22,465 for 1917-18. The total income was £41,627. After contributing £3,840 to the sinking fund, and paying £2,744 as interest on loans, the net profit for the year was £8,773.

CLONTARF AND HILL OF HOWTH TRAMROAD COMPANY.—The ordinary meeting of the shareholders of the Clontarf and Hill of Howth Tramroad Company was held on February 11, Dr. W. Lombard Murphy presiding. The directors' report declaring a dividend at the rate of 3 per cent. per annum, and 1s. per share bonus, free of income tax, was adopted.

FIFE TRAMWAY, LIGHT AND POWER COMPANY.—After providing for interest on the debenture stock, etc., and including £5,095 brought forward, a net profit of £34,279 is shown for the year ended December 31, 1919. A dividend of 8 per cent., less tax, is recommended after transferring £10,000 to reserve and carrying forward £4,679. A year ago the rate was 7 per cent.

CHATHAM LIGHT RAILWAYS.—The report of the Chatham and District Light Railways shows that the number of passengers rose from 14,015,100 to 16,198,000, and the receipts from £66,800 to £78,100. The net revenue was £26,200, as compared with £28 800. The ordinary dividend is reduced from 9 to 8 per cent. The sum of £2,400 carried over is £400 less than last year.

LIVERPOOL TRAMWAYS EXPENDITURE.—The estimates of the Liverpool Tramways Committee provide for an expenditure on tramways of £1,367,475, as compared with £965,641 in 1919, and on electric supply account £684,535 on capital account, against £119,357 in 1919 ; £63,873 on reserve and renewal account, against £50,922 ; £530,000 on revenue account, against £457,930 ; and £687,500 on interest and sinking fund, against £588,859. It is anticipated that the receipts on both undertakings will be more than sufficient to meet the expenditure.

HONGKONG TRAMWAY COMPANY, LIMITED.—The Local Board in London have received the following telegraphic information from the head office in Hongkong :—The profit for 1919, subject to audit, amounted to £38,134, which, added to the amount brought forward from 1918, makes £39,616. At the annual general meeting to be held in Hongkong on April 14 next the Board of Directors will recommend the payment of a final dividend of 1s. 3d. per share, which will absorb £20,312, making, with the interim dividend of 9d. per share (£12,187) paid in August last, 2s. per share for the year, and leaving to be carried forward £7,116.

SUNDERLAND TRAMWAYS ESTIMATES.—The estimates of the Sunderland Corporation Tramways for the year ending March 31 next show increases in revenue and expenditure. The income from traffic revenue, it is estimated, will be £148,000, an increase of nearly £30,000 on last year. The total working expenses will be £106,840, against £67,320 last year, the increase being largely due to higher wages, while the cost of current has gone up by nearly £6,000. The balance of £41,470 for the net revenue account is £10,000 less than a year ago, and from it the usual sum of £5,000 will be handed over in relief of the borough rate.

DERBY CORPORATION TRAMWAYS.—A net profit of £8,190 for the year ending March 31, 1919, is shown in the annual report

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of the Derby Corporation Tramways, as compared with £6,580 for the previous year. During last year the traffic receipts for the electric cars were £77,352, as against £63,734 in 1917-18, while "other receipts" showed a fall from £826 to £822. Working expenses in 1918-19 were £54,472, while in 1917-18, they amounted to £43,144. Per car mile the average expense rose from 10.306d. to 12.771d., an increase of 2.465d. Notwithstanding this the net profits were the highest in the history of the undertaking.

General Electric Company, Limited.—At an extraordinary meeting of the General Electric Company on February 14, a resolution was passed providing that £1,800,000 preference shares at present unissued be converted into 7½ per cent. "B" cumulative preference shares. Mr. H. Hirst, the chairman, reminded the shareholders that at the last annual meeting the Board's programme was outlined, and the capital increased from £3,000,000 to £6,000,000. In carrying out their programme, considerable progress with new work had already been made with the assistance of their bankers. It was now thought desirable to make an issue of further capital, but they found it hardly practicable to do so on the conditions under which the last increase of capital was made. The new issue will take the form of 7½ per cent. "B" preference shares and some ordinary shares.

Tyneside Tramways.—Dr. J. T. Merz, presiding at the meeting of the Tyneside Tramways and Tramroads Company, said that for the year the revenue of the company had increased by over £7,000. It might be expected that the company was earning more profit, but because the costs had increased by an amount equal to double that of the increase in revenue, this was not so. Out of the special reserve put aside in order to meet repairs which should have been carried out in former years, they had allocated the sum of £3,000. In addition to these increased costs there was an addition in the interest charges mainly owing to the re-issue of debentures with a somewhat increased rate of interest. They were paying the same dividend as last year, namely, 5 per cent. on the preference shares and ordinary shares. The directors had found it advisable to petition against the Bill which Newcastle Corporation had filed.

Lancashire United Tramways.—The result of the working of the operating companies comprised in the company's system shows a profit for the year of £60,696. The receipts, compared with those of the previous year, show an increase of £35,051. The increase in expenditure amounted to £41,798. The 25 motor coaches mentioned in last year's report are in service, but the company did not have the full benefit of these last season as anticipated, the majority not being delivered until the autumn. The results were, however, so satisfactory that the directors have decided to extend this side of the undertaking, and have put on order a further 30 vehicles. A proportion of these are covered omnibuses, which it is proposed to use as feeders to the tramway system, and to provide additional passenger transport for outlying districts in the area. A garage has been purchased in Liverpool, and the business is being satisfactorily developed there.

Yorkshire (West Riding) Tramways Company.—Sir H. S. Leon, chairman, presiding at the meeting of this company on February 6, dealt with the difficulties under which all tramway undertakings were at present working. The demand for higher wages, while legitimate enough, was unfair in its action in connection with undertakings tied up to an obsolete statutory fare per mile. A penny a mile is now inadequate, but even worse than this was the obligation to provide even cheaper fares for workmen who in many instances were receiving wages far beyond those in ordinary trade or business. The Temporary Increase in Charges Act penalised public utility undertakings, and it was difficult to find any justifition for it. That company had not found it necessary to apply under this Act, so that its finances could be considered more hopeful than those of some other undertakings. He hoped the Government would deal fairly with the transport industry and permit it to raise its fares reasonably. Their own traffic increase throughout the year had been steady and he hoped it would continue. A large sum had been set aside this year for depreciation and renewals, a necessary precaution in these days of fluctuating prices.

The Lancashire United Tramways, Limited.—The ordinary general meeting was held at Winchester House, London, E.C., on February 24. Mr. J. M. Henderson took the chair, in the unavoidable absence of the Chairman (Hon. Sir Arthur Stanley G.B.E.), and in submitting the report and balance sheet to December 31 last, gave a summary of the Company's operations for the year. The high cost of working had reached a point when it became necessary for the South Lancashire Tramways Company to apply to the Ministry of Transport for powers to raise fares and a temporary Order authorising increases for twelve months was granted, the increases being put into force at the beginning of this year. These increases will help towards meeting the very high working expenses and heavy cost of reconstruction. The lease held by the New St. Helens and District Tramways Company, Limited, expired on September 30 last, and that Company is being wound up. The Company hold about 80 per cent. of the issued capital of the St. Helens Company, and the amount receivable on liquidation will be in excess of the sum at which the shares stand in the Company's books. Of those serving in the Forces at the time of the armistice 67½ per cent. have resumed their positions with the Company.

Paisley District Tramways Company.—The report of the directors for the year ended December 31, 1919, showed that the revenue amounted to £126,529, and expenditure to £100,238, leaving a balance on the working of £26,291. After paying general interest (£130), income tax (£5,766), interest on debentures (£3,200) and debenture sinking fund (£1,500), requiring £10,596, there was a balance of £15,695, and including the amount brought forward (£6,072) there is a disposable sum of £21,767. This is to be allocated as follows:—General reserve, £6,000; dividend on cumulative preference shares, £7,500; preference share sinking fund, £2,000; balance to be carried forward, £6,267. While the traffic receipts showed an increase of £5,454, expenditure increased by £20,418. This increase was caused by a further considerable rise in wages, shorter working hours, and the great rise in the cost of material. The Directors in May last made an application to the Board of Trade under the Temporary Increase in Charges Act, 1918, and permission was given for the following charges:—For ordinary passengers, 1d. for each two half-mile stages or any part thereof; workmen and children a minimum fare of not less than 1d. The changes were put into operation in November, but since the application was made, costs both in wages and materials have further risen, and it is not anticipated that in the current year the relief obtained by these increased fares will cover the increased cost, so that it may be necessary to make application for further modification.

Torquay Tramways Company, Limited.—Mr. L. B. Schlesinger, chairman, presiding at the meeting on February 27, said that the results of the year's work were very satisfactory. The payment of a dividend of 8 per cent. (as compared with 7 per cent. for the previous year), free of income-tax, was recommended, after transferring £10,000 to reserve and renewals and carrying forward £5,785. A sum of £3,000 was to be placed to reserve for equalisation of dividends. The financial position of the company was quite strong. They finished the year with investments, cash in hand and at the bank, etc., to the value of £61,674, as compared with £44,106 in the previous year. The increase in traffic revenue was slightly more than the increase in operating expenses. The condition of the track and rolling stock compared favourably with that of any undertaking in the country. The number of passengers carried during the year (6,751,441) created another record, being 842,000 over the previous year. In the current year their receipts had been well maintained. After careful investigation into the possibilities of a motor omnibus service around Torquay, they had placed an order for ten omnibuses, the delivery of which will be commenced within a few weeks. The proposal was to connect Torquay with Newton Abbott, Teignmouth and Dawlish, and later on with Exeter and Brixham and Totnes. The strong financial position of the company enabled this expansion to be effected without increasing the capital. They anticipated a rapid development of the motor omnibus service with profit to the company.

DIVIDENDS OF THE UNDERGROUND GROUP.

The London Electric Railway Company's final dividend on the ordinary shares is ⅝ per cent., making 1⅝ per cent., against 2 per cent.; £20,942 is carried forward.

Metropolitan District Railway declares a final dividend on the 5 per cent. second preference stock of 1¼ per cent., making 4 per cent., against 5; £22,098 is carried forward.

London General Omnibus Company's final dividend is 3 per cent., free of income-tax, making 7 per cent., tax free, for the year 1919, against 8 per cent.; £59,726 is carried forward.

City and South London Railway.—A final dividend on the consolidated ordinary stock of 1 per cent. is declared, making 2 per cent. for the year, the same as for 1918, and £19,750 is carried forward.

Central London Railway.—A final dividend on the undivided ordinary stock of 1¼ per cent. is declared, making 3½ per cent. for the year 1919, against 4 per cent. A final dividend on the preferred ordinary stock of 2 per cent., making a dividend for the year 1919 of 4 per cent., and a dividend on the deferred ordinary stock of 3 per cent., are declared, and £11,762 is carried forward.

The Underground Electric Railways Company of London.—The revenue permitted payment of the full interest to December 31, 1919, on the 6 per cent. first cumulative income debenture stock, and interest at 1 per cent., free of income-tax, on the 6 per cent. income bonds of 1914, for the half-year, with a carry forward of about £34,000, subject to further fluctuation in exchange.

Dundee Tramway Management.—The Tramways Committee have decided to recommend the Town Council to advertise for a manager at a salary of £600 per annum. A list of the manager's duties has been drawn up, and includes the entire management of the system, with the exception of the permanent way, which comes under the city engineer's department, and the settling of compensation cases and third party risks.

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PERSONAL.

Mr. J. Smith has been appointed engineer-in-charge by Swansea Electricity Committee.

Mr. O. A. Parker, of Torquay, has been appointed rolling stock superintendent of Wigan Corporation Tramways.

Mr. R. N. Tweedy has been demobilised, and is now practising as a consulting engineer at 16, Ely Place, Dublin.

Mr. Alfred Dickinson is again visiting India on business connected with important enterprises for which he is acting.

Lieut.-Colonel Fraser, D.S.O., has been appointed superintendent of organisation for the Yorkshire Electric Power Company.

Mr. R. H. Scotson, electrical engineer for Middlesbrough, has been granted an increase in salary from £550 to £700 per annum.

Mr. Ernest Stubbs has been appointed assistant engineer at the power station by the Cape Town Electricity Committee at a salary of £720 per annum.

Mr. W. Y. Smith-Saville has been appointed chief engineering assistant to Mr. H. P Stokes, general manager of Plymouth Corporation Tramways.

Mr. Arthur Neal, M.P., parliamentary secretary to the Ministry of Transport, has appointed Mr. F. Gordon Tucker, O.B.E., T.D., to be his private secretary.

Mr. A. R. Fearnley, general manager of Sheffield Corporation Tramways, has been retained by Lancaster Corporation to prepare a report on the question of mechanical traction.

Mr. Richard Hoggard, of Sheffield Corporation Tramway Department, has been appointed traffic superintendent of the Wigan Corporation Tramways. There were 64 applicants for the position.

Mr. A. N. Moore, electrical engineer, and **Mr. N. J. Young,** general manager of Newport Tramways, have been granted increases in salary to £800 as from January 1 last, from April 1 to £850, and from January 1, 1921, to £900.

Sir John Snell, as a consequence of his appointment as Chief Electricity Commissioner, has withdrawn from partnership with Messrs. A. H. Preece, J. H. Rider, and J. H. Woodward, consulting engineers, Queen Anne's Gate, S.W.

Mr. Peter Fisher, general manager and engineer of Dundee Corporation Tramways, owing to reasons of health, has resigned as from August 15th next, and has been appointed consulting engineer at a retaining fee of £200 per annum.

Mr. F. H. Glover, tramway works assistant engineer of Reading Corporation, has been appointed chief assistant at a salary of £450 per annum, and the remuneration of Mr. C. H. Jones and Mr. C. H. Stafford, other assistant engineers, has been increased.

Mr. T. W. Hudson has been appointed by the London County Council charge shift engineer at Greenwich power-station at a salary of £250 a year, rising by annual increments of £10 to £300 a year, based on pre-war conditions. The first year's service is to be on probation.

Mr. George G. Braid has been recommended for appointment as deputy engineer of the Glasgow Corporation tramways department at a salary of £800 a year, and **Mr. James McDonald** as chief electrical assistant at a salary of £500. These changes are consequent upon the appointment of Mr. E. T. Goslin to the position of general manager and engineer of the Clyde Valley Electric Power Company.

Mr. F. C. Wilson has been appointed chairman of the Liverpool Tramways Committee in succession to Alderman E. Russell Taylor, who some time ago announced his decision to retire from the position on account of other business engagements. Mr. Wilson has been a member of the committee for about ten years, and has taken a deep interest in the business of the tramways and electricity undertakings.

Mr. C. J. Spencer, who recently visited the United States, has consented to give to the members of the staffs of the Metropolitan Electric Tramways, the London United Tramways, Limited, and the South Metropolitan Electric Tramways a series of lectures entitled "A Transport Man's Visit to America." The first of the series was delivered at Twickenham Town Hall on March 8, when Mr. J. Devonshire took the chair.

Mr. John Terry, operative superintendent of the London County Council tramways, has retired after forty years' service. At a concert at the Memorial Hall, Mr. Terry received an illuminated address and a cheque for £300, the presentation being made by Mr. A. L. C. Fell, the general manager. The proceeds of the concert were set aside for the benefit of St. Dunstan's. In four days two thousand tickets were purchased by the tramways staff.

Mr. Charles G. New has been appointed to the position of electrical engineer of Cardiff Corporation. He has been for seventeen years in the service of the Corporation, the last thirteen years as deputy to Mr. Ellis, the former engineer and chief of the tramways department. From 1908 to 1915 he was lecturer in electric lighting and power transmission at the University College, Cardiff, and from 1911 to 1914 he was local examiner to the Association of Mining Electrical Engineers.

Mr. G. F. Craven, who recently resigned the position of general manager of Reading Corporation Tramways on his appointment as a director of Allen and Simmonds, Limited, has been presented with a silver salver by the employees and staff of the Reading tramways department. Alderman C. G. Field, chairman of the Tramways Committee, in making the presentation, spoke highly of Mr. Craven's ability and of the efficiency of the tramways undertaking under his management.

Mr. Arthur Ellis, who at the end of last year resigned the position of tramways manager and electrical engineer of Cardiff Corporation to take up consulting work, was presented, on March 8, with an illuminated address by the City Council. The Lord Mayor (Councillor G. F. Forsdike) said that Mr. Ellis had for twenty years given conscientious, efficient, and able service, and the Council wished him God speed in his new work. Mr. Ellis, in reply, said that he felt very deeply the breaking of an association that had lasted so long, and promised every assistance to his successors, Mr. New and Mr. Horsfield.

Mr. Robert L. Horsfield on March 8 was appointed to the position of general manager of Cardiff Corporation Tramways. Mr. Horsfield has been engaged in tramway work for twenty-nine years, and has been a manager for nineteen years. He was engaged as assistant to the Bradford Tramways Company from 1891 to 1899, and from 1899 to 1902 he was manager and secretary to the company. When the undertaking was transferred to the Bradford Corporation Mr. Horsfield was for twelve months principal assistant to the general manager of the Walsall Corporation Tramway system. He is a member of the executive council of the Municipal Tramways Association.

Mr. James M. Calder, who was recently appointed general manager and engineer of Reading Corporation Tramways, is a native of Dundee. He served his apprenticeship with Messrs. Lowdon Brothers and Company, electrical engineers, and was later in the employ of Messrs. Cooper and Greig, Limited, afterwards going to sea as an engineer. Later he became engineer in charge of the overhead equipment of Ipswich Corporation Tramways, and then went to Reading as chief assistant to the general manager. As general manager and engineer his salary will be £700. Mr. Calder has been connected with the department for fourteen years, and for the past eight years has been chief assistant.

Mr. E. T. Goslin, electrical engineer of Glasgow Corporation Tramways, has been appointed general manager of the Clyde Valley Electrical Power Company in succession to Mr. Archibald Page, who has been appointed a technical member of the Commission under the Ministry of Transport for the control of electricity supply. Mr. Goslin began his career in London with Crompton and Company, Limited. After filling other positions, he entered the service of the Glasgow Corporation Tramways Department in 1900, and during the past eighteen years occupied the position of Chief Electrical Engineer. During the war he was lent to the Coal Controller, and afterwards became Deputy Director of Labour in the Ministry of National Service.

Short Lists for Cardiff Appointments.—Eighty-three applications were received for the appointment of electrical engineer, and forty-four for the appointment of tramways general manager by the Cardiff Electrical Lighting and Tramways Committee, the position having been rendered vacant by the resignation of Mr. Arthur Ellis. The short list for the post of electrical engineer included—Mr. H. Ball, Hull; Mr. S. E. Britton, Chester; and Mr. C. G. Morley, New Cardiff (at present acting manager, and formerly chief assistant to Mr. Arthur Ellis). For the post of tramways general manager the applications were also reduced to three, viz., Mr. Roberts Lund Horsfield, Walsall; Mr. J. Dobson, Southampton; and Mr. T. Potter Easten, Newcastle-on-Tyne. As mentioned in other notes, Mr. New has been appointed electrical engineer and Mr. Horsfield general manager.

Mr. Percy Priestly, who has held the position of deputy general manager of Liverpool Corporation Tramways since 1918, has been appointed general manager in succession to Mr. C. W. Mallins, who recently resigned owing to ill-health. Mr. Priestly served his apprenticeship with Sir William Allan, Limited, Scotia Engineering Works, Sunderland, and went through the practical and commercial side of the business as well as the drawing office. After leaving Sunderland he had five years marine experience, and holds a first-class Board of Trade certificate. Becoming assistant engineer of Halifax Corporation electricity undertaking in 1901, he was ten months later appointed general manager and engineer of the Mexborough and Swinton Tramways Company. In March, 1916, he was appointed general manager and engineer of the Oldham Corporation Tramways, a position he held until April, 1918, when he became deputy manager of the Liverpool Corporation Tramways. Under Mr. Mallins he has had full control of the workshops, depots, and traffic arrangements, and has also been responsible for the arrangements of the new motor omnibus service.

Summer Time, it is officially announced, will come into force at 2 a.m. on Sunday, March 28, and will continue until 2 a.m. on Monday, September 27.

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TRAMWAY AND LIGHT RAILWAY NOTES.

ACCRINGTON.

The manager of Accrington Corporation Tramways (Mr. H. Pilling) has been asked by the Tramways Committee to report at an early date on the position and prospects of the tramway system in the borough. With present costs the situation is becoming very difficult.

AYR.

NEW CARS AND TRACK RECONSTRUCTION.

Ayr Town Council has decided to order six new double-deck cars at a probable cost of £2,400 each. At a meeting of the Tramways Sub-committee of the Ayr Tramways Committee, Mr. Ferguson's report on the condition of the track was received. Mr. Ferguson recommends that the renewal of the track should be carried out gradually, as the money at the credit of the depreciation account will permit. The committee, having heard the tramways engineer, recommended that two sections be proceeded with as soon as possible. The estimated cost of the first section to be repaired is £4,569, and for the second section £30,000. It is expected that the work will not be completed until Whitsuntide, 1921. The committee also recommend that the lines be doubled from the car sheds to Prestwich at a cost of £14,420. The greater portion of this cost will be met by borrowing under unexhausted borrowing powers.

BLACKPOOL.

PLANS FOR TRACK RECONSTRUCTION—LOANS TO BE OBTAINED.

Reconstruction of the permanent way at Blackpool has been practically decided upon, and the Borough Treasurer (Mr. William Bateson) has issued a financial report on the subject. He says that the mileage involved is 17 miles, 6 furlongs, 5·75 chains, measured as single track length. He estimates the cost of relaying the permanent way and doubling the line in Dickson Road at £254,343, and the life of the track after renewal at fifteen years. The balance of loan yet to be redeemed on the original track amounts to £52,097. The Ministry of Transport is expected to give the Corporation borrowing powers for the sum required on the understanding that the non-repaid loan debt will be provided from revenue or reserve funds. The Borough Treasurer recommends application to the Ministry for sanction to borrow the sum required repayable in fifteen years, and that the balance of non-repayment loan be obtained from the permanent way renewal fund. In addition, it is proposed to expend the following sums on entirely new work on permanent way—£34,864 in 1920-21; £8,439 in 1922; and £8,874 in 1923; total, £52,177.

BOURNEMOUTH.

RECONSTRUCTION OF TRACK AND NEW ROLLING STOCK.

The Town Council has considered a report by the tramways general manager (Mr. I. Bulfin) on the present position in connection with the reconstruction of the track, and it was agreed that sanction should be sought from the Board of Trade to borrow £130,000 for reconstruction of track and £70,000 for new cars. The chairman of the Tramways Committee (Mr. F. J. Bell) said the general manager was doing everything possible to expedite preparation for the work. The entire trouble was to obtain rails. The committee thought it inadvisable to take up roads and let them stand idle until the second delivery of rails, and the advisability of having the rails seaborne from Middlesbrough had been considered with a view to expediting delivery, although it would probably cost more.

BRISTOL.

COMPLAINTS OF SERVICE AND DEMAND FOR SUNDAY CARS.

In correspondence that has taken place between the Bristol Chamber of Commerce and the Bristol Tramways and Carriage Company, the Chamber contends that the present service is inadequate, and urges the company to run a greater number of cars during the hours of heavy traffic, to provide an extension of the service on all routes until a later hour at night, and to resume Sunday services. The company has replied, drawing attention to the difficult conditions brought about by the war, as a consequence of which the equipment and rolling stock require complete overhaul and extensive renewal. The work has been pressed forward as much as possible, and at the present time there are 20 per cent. more cars running throughout the day than before the war, and the number will be further increased in a short time. They consider that the running of cars to a later hour at night is not required, and they cannot see their way to provide a service on Sunday. The Town Council has passed a resolution stating that the Council was of the opinion that no sufficient reason exists for the suspension of travelling facilities formerly afforded on Sundays, and that in the interests of the citizens the service should be resumed.

BURNLEY.

QUEUE SYSTEM INTRODUCED AT TRAMWAY CENTRE.

Burnley tramways have adopted a scheme for the formation of queues to secure better regulation of traffic in the tramway centre. While the scheme awaits the approval of the Town Council, the new regulations were introduced on February 1, and an appeal was made to the public to observe them. The arrangement is that each car is to unload all except through passengers at prescribed unloading places, and to proceed empty except for through passengers until it arrives with its rear end opposite the head of its particular queue. Certain alterations have been made in existing stopping places that it is thought will facilitate the smooth working of the cars. The construction of a waiting-room has been suggested near the car route at Lane Head.

CARDIFF.

COST OF TRACK RECONSTRUCTION.

At a meeting of Cardiff Council the chairman of the Tramways Committee (Alderman Sir J. W. Courtis) read a letter from the Consolidated Traction Company, Limited, stating that the firm was in a position to carry out tramway reconstruction work in an expeditious manner. The cost of reconstructing lines in Cardiff to-day would be £16,500 per mile of single line, and the company would undertake to carry out the work at the rate of about half a mile per week. On the suggestion of the chairman, the letter was referred to a joint meeting of the Public Works and the Tramways Committees.

DUBLIN.

WAGE INCREASES.

Negotiations between Dublin United Tramways Company and their employees terminated on February 12, the men agreeing to accept an amended offer of 5s. advance for men and 2s. 6d. for boys, to take effect as from January 1 last. The original demand was for 6s. and 3s. respectively.

EDINBURGH.

MOTOR OMNIBUSES AND A CABLE BREAKDOWN—EMPLOYEES' PASSES AT EDINBURGH.

Traffic on the Leith Walk and London Road routes of the Edinburgh Corporation Tramways was completely stopped by the stranding of the cable (which provides power for both routes) in London Road about 3 p.m. on Friday, February 21. The stranding of the cable extended over a considerable distance, and it was impossible to complete the necessary repairs on the same day. As in the case of some previous breakdowns, motor omnibuses were employed, and a two and a half minutes' service was arranged. This was, of course, inadequate to cope with the traffic, but the omnibuses conveyed a fair percentage of those who desired to travel. The Tramways Committee have decided to take no action on a letter from the secretary of the National Union of Corporation Workers suggesting that passes should be granted over the tramway system to all employees in the Corporation service. At present free passes are given to employees in the tramways department.

GLASGOW.

QUEUE SYSTEM ADOPTED—NO ALL-NIGHT CARS.

A trial is being made on the Glasgow tramways with queues for passengers. The first experiment has been carried out at the corner of Bell Grove Street and Duke Street, where a number of passengers congregate at the rush hours in the morning, and there have been complaints of disorderly crowding which it is hoped that the institution of a queue will avoid. The Tramways Committee have decided not to institute an all-night service of cars. The Town Clerk, who had been asked to report regarding the fares which could be charged for such a service, had given his opinion that the suggestion made in a report by the general manager that only one fare be charged to and from the centre of the city could not legally be adopted, except in respect of through cars, and that for an ordinary all-night service the maximum fare of 1d. per mile should not be exceeded. Inquiries made by the manager showed that only a very small number of regular workers would be likely to make use of the service.

GREAT GRIMSBY.

NEW CARS PURCHASED.

Mr. H. L. White, manager of the Great Grimsby Street Tramways Company, has been fortunate in obtaining eight additional cars, four of them from Sheffield Corporation, and Cleethorpes Council has been informed that more cars will be put in service as soon as possible.

HUDDERSFIELD.

SNOW PLOUGHS KEEP CARS MOVING.

In the vicinity of Huddersfield a storm with snowfall began on Thursday, February 19, but the service was well maintained until 8 p.m., when the weight of the snow brought down telephone and guard wires and so caused trouble with the trolley wires. Snow ploughs were put to work about 8 p.m., and the cars were consequently kept going until 10 p.m. As ploughs were kept at work all night the lines were in readiness for a start in the morning. One car was stalled on Leach's Hill, Out Lane, and the car with the driver and the conductor had to remain until released by the snow plough about 6 a.m.

KIRKCALDY.

FUTURE OF ELECTRICITY UNDERTAKING AND TRAMWAYS.

The Town Clerk has prepared a report for the Town Council on the position of the electricity and tramway undertaking. There is a great demand for electricity, but the Electricity Commissioners will not allow the Town Council to extend their generating station

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or to build a new one. The officials in London and the Fife Power Company desire apparently that Kirkcaldy shall sell its generating station and take a bulk supply. The Town Clerk's opinion is that the town should endeavour to sell both the generating station, distribution cables and distribution rights, and consider seriously whether they should not also endeavour to sell the tramway undertaking. The success of the undertaking and the price of the fares depend to a considerable extent on the price of current, and the supply of current would in future be in the hands of the Fife Power Company.

LEICESTER.

INCREASE IN SALARY OF TRAMWAY CLERICAL STAFF.

In compliance with an application by the Leicester branch of the National Union of Clerks on behalf of the clerks of Leicester Corporation Tramways Department, the scale of salaries adopted in 1914 has been increased by 120 per cent. and all war bonuses have been merged in permanent salaries. Under the new scale the salaries of the second-class clerks will rise by annual increments to a maximum of £4 16s. 10d. per week at 29 years of age, and first-class clerks by annual increments to a maximum of £6 13s. 6d. The result of the action of the clerks' union is the definite abolition of the temporary expedient of the war bonus and the standardisation of salaries on a permanent basis.

LEEDS.

EXTENSIONS TO HOUSING CENTRE—"PANIC-MONGERING."

Progress is being made with plans for a tramway to serve the houses which the Leeds Corporation are erecting on the Middleton estate. The matter has been discussed by members of the Tramways and the Improvements Committees, and they have agreed to recommend the City Council to sanction an immediate commencement of the work. At a meeting of the City Council, Alderman W. E. Farr asked the chairman of the Tramways Committee when it was proposed to repair the tramway lines on the Headingley route between Shaw Lane and Cottage Road, "which for some time had been in a highly dangerous condition." Alderman R. A. Smithson, chairman, said that the 100 yards or so to which attention had been called out of the 120 miles of their track rested on a very bad foundation. It was hoped to start on the repairs soon. He objected, however, to the words "highly dangerous." The engineers said there was nothing at all dangerous in the condition of the track at this point. He added that the arrears of six years could not be made up at once, and asked for patience. The members ought not to be panic-mongers by using such terms as "highly dangerous." The judgment of engineering experts ought to count for more than the haphazard remarks of the man in the street, and it was the duty of the Councillors to reassure the public.

LLANDUDNO.

COUNCIL TO ACQUIRE A CABLE TRAMWAY.

Llandudno Council is in negotiation with the Great Orme Tramway Company with a view to taking over the cable tramway to the summit of the Great Orme's Head that was constructed by the company about twenty years ago. This year, for the first time, the Company will pay a small dividend. The Council will be entitled to acquire the undertaking in eight years time under the modification of tramway terms. The electrical engineer of the Council has been requested to present a report on the electrification of the tramway, and the Council has asked the company to fix a price at which they will be willing to sell the undertaking.

LIVERPOOL.

GOODS SERVICE AT NIGHT—A SERVICE BREAKDOWN.

Liverpool Tramways Committee has asked the general manager to present a report on the question of using the tramways for goods service at night. About 8.30 p.m. on February 22 a complete stoppage of the car service was caused by a fault at the electric supply station. The cars were crowded, but the passengers had to find other means of transport or wait; and it was not until 9.30 that sufficient energy was available to restart the cars.

MAIDSTONE.

TRACK DOUBLING POSTPONED—WOMEN CONDUCTORS RETAINED.

The question of the proposed doubling the light railways between the railway station and Barming has been postponed. The Council has refused a request of the local Trades Council to employ men instead of women as tramway car conductors. It was stated that the women received a maximum of £2 2s. per week, and that the men would do the work for £2 10s.

MANCHESTER.

£160,000 FOR TRAMWAY IMPROVEMENT—NEW CARS AND SHEDS—FATAL ACCIDENT AT A CAR DEPOT.

Power is being sought by the Tramways Committee of Manchester City Council to borrow additional capital for the provision of more tramway cars and the extension of the car sheds. It is expected that during the financial year it will be necessary to incur expenditure in respect of these works to the amount of approximately £160,000. A short circuit on a trolley wire was the indirect cause of the death of a driver of a Manchester Corporation car. At the inquest held by the city coroner on February 11, it was stated that driver Medlicott was preparing to take a car out of Hyde Road shed on January 23, and was putting the trolley on the wire when there was an emission of sparks. This startled Medlicott, who overbalanced and fell into the pit, sustaining serious injuries, from which he died on February 8. The sparking was due to the trolley wheel coming into contact with a tie-bar on the roof. Expert evidence showed that it was impossible for him to have received an electric shock, and the coroner returned a verdict of accidental death.

PLYMOUTH.

TRAMWAY EXTENSIONS, NEW CARS AND MOTOR OMNIBUSES—FREE TRAVEL FOR THE BLIND.

The Town Council has approved the recommendations for the extension of the tramway service in various districts—the provision of 14 new tramcars at a cost of £28,000, 20 motor omnibuses at a cost of £30,000, for the establishment of new services, and the purchase of machinery and plant to the value of £5,000. Sanction will be sought to borrow £63,000. The Tramways Committee propose to permit blind persons to travel free, subject to conditions which will be printed on the passes to be issued.

PORTSMOUTH.

SMOKING NOT ALLOWED IN FRONT OF TROLLEY STANDARD.

Portsmouth tramway conductors have been given instructions to enforce strictly the regulation prohibiting smoking except behind the trolley standards of the cars.

PRESTON.

FREE PASSES FOR THE BLIND.

Preston Tramways Committee have decided to recommend that free passes be issued to blind people. It is estimated that the number of passes that will be required is about 200.

SHEFFIELD.

CARS AND OMNIBUSES—CARS TO BE VESTIBULED—SHELTERS WANTED.

The Corporation now has 385 cars, and the total length of tramway track is 79 miles. In addition the tramway department owns 40 motor omnibuses, and these at present provide services over 40 miles of roads. Fifty open-end tramcars of Sheffield Corporation are to be fitted with vestibule ends at a cost of £240 per car. The Sheffield *Daily Telegraph* has advocated the construction of more tramway shelters. It cites a number of points at which large numbers of passengers congregate and have to wait for cars without any protection from the weather. Special notice is taken of the lack of suitable shelters at the tramway centre, where there appears to be ample space for the erection of a well-designed waiting place.

WALSALL.

CHRISTMAS DAY SERVICE DEMANDED.

A meeting of the Trades Council on January 28 passed a resolution contending that the tramway employees had no right to "hold up" the public by refusing to run the cars on Christmas Day, and requesting the Town Council to ensure that there was a car service on December 25 in future. One speaker argued that if the tramway employees were entitled to the day off, then the postmen, milkmen, and other workers were equally entitled to cease work; and if all the public services were stopped he was sure it would not be long before many working men would complain.

WARRINGTON.

NEW CARS AND MAINTENANCE.

The Corporation have obtained four new cars. During the last few years all the old cars have been required to meet the traffic demands, and repairs have consequently had to be deferred. With the new cars there is a possibility of overtaking the arrears of work.

WALTHAMSTOW.

CONDUCTOR ATTACKED BY ROBBERS.

Three men, whom the conductor had admonished for disorderly behaviour, made an unsuccessful attempt to rob him at Walthamstow on February 22. The conductor resisted, and threw one of the men from the steps. Passengers came to his assistance, and the other two men fled. The conductor was severely bruised. One man was arrested by a police constable, but on the way to the station was rescued by other men.

YORK.

WARNING TO OBSTRUCTIVE PASSENGERS.

The Tramways Committee have given instructions that cautionary letters should be sent to persons who have either obstructed the conductors in their work or have made themselves offensive by their conduct in the cars. Notices are to be placed within the cars to the effect that any passenger having a complaint to make should send the same in writing direct to the tramway offices, giving the time and the number of the car.

Omnibuses to be Disinfected.—Lambeth Borough Council recently urged the disinfection of omnibuses, and in view of the danger of another influenza epidemic the London General Omnibus Company has arranged to spray motor omnibuses daily with disinfectant. The London County Council have promised to consider the question of disinfecting their tramway cars.

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CONTRACTS AND ORDERS.

Hadfield's, Limited, have an order from Wolverhampton Tramways Committee for special track work at £1,848.

W. T. Henley's Telegraph Works, Limited, have received an order for cable from Ilford Council, at £2,652 10s.

E. Green and Son, Limited, are to supply four sets of economisers for the Back-o'-th'-Bank electricity station. Bolton.

The English Electric Company, Limited, have received an order from Dover Council for five single-deck tramcar bodies at £6,750.

Burnley Town Council has accepted the tender of the British Thomson-Houston Company for five electric tramcar equipments at £4,016.

Bournemouth Corporation have placed an order with William Griffiths and Company, Limited, for permanent way reconstruction work at £139,230.

Salford Tramways Committee has accepted the tender of the British Mannesmann Tube Company for 70 weldless steel tubes at £2,270 7s. 6d.

Ilford Electricity Committee have accepted a tender for a fan draught cooling tower of 2,800 gallons capacity from Devonport Engineering Company, at £4,843.

J. W. Courtenay, Limited, of Amberley House, Norfolk Street, London, W.C., have been appointed sole advertising contractors for the Darlington Corporation Tramways.

The Woods-Gilbert Rail Remodelling Company, Limited, have secured a contract from the London County Council for the removal of high rail checks on 50 miles of single track tramway.

Ed. Bennis and Company's tender has been accepted by Swansea Electricity Committee for an elevator capable of raising 20,000 tons of coal per hour with delivery to a chain conveyor.

Clough, Smith and Company, Limited, of 36, Victoria Street, Westminster, S.W.1, have been awarded the contract for the erection of overhead mains for the Rhondda Urban District Council.

Halifax Tramways and Electricity Committee has accepted the tender of the British Thomson-Houston Company for the supply and connection of low tension switchgear for a 1,500 K.W. rotary converter.

Salford Tramways Committee have recommended the acceptance of a tender of the Leyland Motor Company for a double-deck omnibus body mounted on a type "G" chassis at £1,890, less 10 per cent.

Scholey and Company, Limited, contractors for Messrs. C. P. Sandberg, have obtained a repeat order from the Leeds City Tramways for the treatment of twelve miles of track by the patent "in situ" process.

Leeds Tramway Committee has accepted tenders for the supply of special track lay-outs from the Titan Trackwork Company at £3,315, and Edgar Allen and Company at £2,483, and for the supply of points from Hadfield's, Limited, at £888.

Sandberg Sorbitic Steel.—During the past twelve months fifteen of the principal tramway undertakings in this country have placed orders for the treatment of upwards of 15,000 tons of tramway rails by the Sandberg sorbitic process at the works.

The City of Melbourne invites tenders for the supply of 12,000 metal filament lamps. Specifications can be obtained from the agents, Messrs. McIlwraith, McEacharn and Company, Proprietary, Limited, Billiter Square Buildings, E.C. Tenders are to be delivered by noon on March 30.

Liverpool Tramways Committee has accepted the tender of the Film Cooling Towers, London, for two batteries of Film cooling towers of a capacity of 465,000 gallons per hour, and that of Worthington-Simpson, Limited, for six cooling towers of a capacity of 750,000 gallons per hour.

Lorain Rails for Birmingham.—Birmingham Corporation have placed an order for Lorain Tramway rails with the United States Steel Products Company at £24 10s. a ton. Shipments are required to begin at the end of April, and to be completed in June. British firms were too busy to meet the requirements of the Corporation, which are urgent.

New Rolling Stock for Burnley.—The Burnley Council have accepted the tender of the English Electric Company for bodies for five single-deck cars and for five electrical equipments from the British Thomson-Houston Company. The bodies will cost £1,350 each, the electrical equipments £936 10s., and the trucks, which will be made by the Corporation, will cost £1,060 each.

PEACOCK BRAKES.

Scholey and Company, Limited, of 56, Victoria Street, London, S.W., have acquired the licence to manufacture and sell Peacock brakes in all countries except the North American Continent, and all inquiries for these brakes and their spare parts should be sent to them. Special attention is here drawn to the matter as the advertisement of the Peacock Brake Company, which appears in this issue, was printed before intimation of the change was received.

PATENT LIST

Abstracted for "The Tramway and Railway World" from the Official Journal of Patents.

***** If the inventions have been communicated the names of the communicators are given in *italics*.**

APPLICATIONS FOR LETTERS PATENT.

The number of the patent is given in brackets.

Indicating arrangement for underground railways, tramways, etc. (1,402)—Automatic Telephone Manufacturing Company, H. L. Sergeant and S. R. Smith.
Locking devices for tramway signals (1,449)—C. J. Cooke, F. Downes and W. D. Rogers.
Air cooling device for motor car engines (1,459)—F. E. Ellis.
Road wheels of automobiles and manufacture of same (1,398 and 1,399)—E. F. Goodyear.
Life guard (1,059)—L. P. W. Gorsuch.
Electric welding (1,152)—E. Greenhalgh and B. Longbottom.
Trolley wheel or contact control mechanism of overhead electric tramway systems (1,302)—J. J. Jennison.
Lifting jacks (1,433)—A. E. Lake.
Arrangement of applying sand behind wheels of tramway car, etc. (1,423)—J. Lambert.
Chairs for tramway rails (1,377)—W. H. Meek and A. E. Sealy.
Apparatus for measuring consumption of fuel in motor vehicles (1,538)—F. O'Brien.
Change speed gear for motor vehicles (1,162)—W. J. Patterson.
Resilient tires for wheels of motor vehicles (1,238)—F. L. Rapson.
Springing devices for motor vehicles (989)—J. D. Rennie.
Variable friction drive for motor vehicles (1,609)—P. H. Saunders.
Self-contained driving unit for motor vehicles, etc. (1,111)—H. P. Saunderson.
Means for ventilating interior of tramcars, etc. (1,170)—S. G. Smith.
Passenger safety guard for omnibuses (1,339)—E. J. Wilkin.
Life guard for automobiles (2,131)—L. Abraham.
Controllers for electric railways operated by high voltage direct current (1,973)—Akt.-Ges. Brown, Boveri et Cie.
Gear driving mechanism for motor vehicles (1,748)—P. A. Albrecht.
Jacking apparatus (2,199)—W. F. Cottrell.
Driving mechanism of motor vehicles (1,890)—L. Court.
Route indicators for tramcars, etc. (1,719)—W. Cowley.
Variable speed and differential gear (1,868)—R. H. Dick.
Auxiliary starting devices for motor cars, etc. (1,864)—T. A. Evans.
Trollies for electrical connection of trams, etc., with their conductors (1,694)—H. George.
Road vehicle direction indicator, etc. (1,758)—G. R. Gray.
Electrically propelled vehicle (1,768)—J. H. Hansen.
Lifting jack (1,643)—A. F. Hawkins and N. J. Iddon.
Means for imparting or transmitting additional propulsive energy to a vehicle (2,150)—J. A. Jones.
Tramway sleeper (2,049)—S. Jones.
Spring suspension or shock absorbers for vehicles (1,813)—G. C. McLaughlin.
Transmission gear for motor vehicles (1,802)—J. Maina.
Electrodes for electric arc welding (2,303)—H. Ogden.
Signalling apparatus for power-driven vehicles (1,879)—H. J. Phillips.
Driving gear for front wheels of motor vehicles (1,899)—J. H. Platt and H. Williamson.
Means of transferring petrol, etc., from storage tins to tanks of motor vehicles (2,046)—F. H. Price and J. Saveker.
Cowling for radiators of motor vehicles (2,019)—A. V. Roe.
Power transmission mechanism for self-propelled vehicles (2,166)—P. O. Rowlands.
Tramway rails (2,239)—C. E. Thomas.
Means for adjusting brake shoes of tramway cars (1,955)—S. Thomas.
Motor vehicles (2,171)—F. T. Webber.
Driving mechanism of automobiles (3,066)—V. S. Ashby.
Transmission gear for motor vehicles (3,028 and 3,029)—A. M. Banister, H. Edmunds, F. A. Grimes, R. D. H. Thompson, and P. J. McCarty.
Operating mechanism for vehicle brakes (2,713)—L. Boirault.
Rear axles of motor vehicles (2,887)—F. Bolton.
Electrical systems of power transmission and regenerative braking (2,957)—British Thomson-Houston Company (*General Electric Company*).
Tram conductors' ticket-holders (3,049)—E. Brown.
Motor lorries (2,743)—H. J. Dromgoolie.
Fuel consumption indicators for motor vehicles (2,700)—H. Fletcher.
Multiple-speed and reverse worm drive motor vehicles, etc. (2,626)—T. Gibson.
Change-speed gear for motor vehicles (2,568)—J. and E. Hall and A. R. N. Heath.
Driving self-propelled road vehicles (2,408)—R. W. Hartley.
Insulation of electrical conductors (3,070)—W. T. Henley's Telegraph Works Company.
Traction devices for automobile wheels (2,426)—C. F. Highfield.
Steam-driven road vehicles (2,891)—C. L. Hughes.
Differential device for motor vehicles (2,370)—C. D. Ingleby.
Holders for oil, etc., containers upon motor vehicles (2,701)—P. C. Jones.
Lifting jacks (2,450)—Lake and Elliot and A. D. Powell.
Tires for motor car, etc., wheels (2,949)—L. Landreth.
Motor car chassis (2,572)—R. L. G. Le Grain.

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Sliding doors for tramcars, etc. (2,484)—E. H. O'Brien.
Front wheel brake for motor cars (2,374)—L. Randerson.
Fluid pressure braking apparatus (2,928)—A. W. Rendell.
Motor vehicles (2,670)—T. W. Saunt.
Fluid pressure power transmission for motor vehicles (2,477)—W. H. Simmons.
Springs for motor vehicles (2,872)—A. J. Stevens.
Power transmission mechanism for motor vehicles (3,059)—E. T Waldron.
Direction indicators for vehicles (3,172)—J. W. Boughton.
Omnibuses, etc. (3,148)—G. W. Browne.
Transmission gears for motor vehicles (3,695)—C. J. S. Burt.
Motor vehicle wheels (3,824)—W. Caie.
Motor vehicles (3,638)—Charlesworth Bodies, Limited, and C. Steane.
Automatic switches for motor vehicle electricity systems (3,566)—C. L. I. Manufacturing Company and E. A. Watson.
Electric generators for motor vehicle, etc., lighting and ignition systems (3,567)—C. L. I. Manufacturing Company and E. A. Watson.
Mechanical lubrication(3,808)—H. Cousins.
Signalling system for motor vehicles (3,441)—R. W. Davis.
Motor vehicles (3,558)—H. D. Day.
Combination starter and safety lock for motor car engines (3,126)—F. Lee-Deeks
Devices for controlling speed of automobiles (3,773)—A. Gaillard.
Rail joint (3,772)—G. S. Hambrook.
Lifting jacks (3,155)—G. Hazelton.
Means for preventing motor vehicles taking fire (3,244)—T. Jackson and R. Williams.
Safety check device for hand brakes of motor cars. etc. (3,377)—C. H. Jones.
Elastic tires for motor cats, etc. (3,236)—W. Parker.
Self-propelled vehicle wheels (3,631)—J. T. Pickering.
Lifting jacks (3,108)—F. L. Rapson.
Divisible rims for motor vehicle wheels (3,681)—A. G. S. Vince.
Bodies of railway trucks, commercial vehicles, etc. (4,062)—C. Addiscott.
Tramway rail bed joints and chairs (4,560)—A. C. Baker and H. M. Dudgeon.
Motor fuel (4,562)—Sir G. T. Beilby.
Train speed controlling systems (4,331)—R. Belfield (*Westinghouse Air Brake Company*)
Route indicators for conveyances (4,017)—S. Bennett.
Variable speed gearing for motor vehicles (4,301)—P. Burton.
Spring clutch for trolley head (4,287)—W. C. Catron and A. E. Turner.
Motor lorries and automatic means for securing their detachable bodies in position (4,525)—W. H. Clarke and J. P. Phillips.
Motor vehicles (4,593)—A. A. M. Durrant and T. E. C. Hirst.
Motor car transmission (3,843)—T. A. Fall.
Trolley pole heads for electric vehicles (4,172)—E. Farrell.
Oil indicator for motor vehicles (3,844)—F. H. Guyver.
Means for preventing shocks in bodies of motor vehicles (4,283)—F. G. Hopkins.

SPECIFICATIONS PUBLISHED.

1918.

Warming devices for the steering wheels of motor vehicles (20,061—*137,348*)—H. L. Zeitun and M. R. Moore.
Change-speed gearing for motor vehicles (21,267—*137,349*)—F. J. Sabel.
Motor omnibuses (21,910—*137,358*)—L. G. W. Shire and Birmingham and Midland Motor Omnibus Company.

1919.

Suspending conductor wires on electric railways, etc. (1,986—*137,133*)—F. W. Fawdry and P. Dawson.
Drive and rear suspension for motor vehicles (4,632—*137,161*)—L. W. Winter.
Locking devices for the engine bonnets of motor vehicles (5,239—*137,169*)—F. O. W. New.
Locking devices for motor vehicles (13,392—*137,227*)—H. S. Schroeder.
Wheels for motor cars (29—*137,359*)—J. Jack.
Mechanically propelled road vehicles (2,084—*137,395*)—H. W. Alexander.
Safety appliances or guards for motor vehicles (3,801—*137,407*)—W. C. Croxon and J. Cooke.
Trolley for electric tramways (4,955—*137,417*)—G. Odierno.
Trolley heads for electric tramcars (7,799—*137,437*)—H. R. Tidswell and S. K. Kirkland.
Electric signalling apparatus for cars on electric railways (8,877—*125,948*)—H. Schaub and C. Kunzli.
Means for effecting the propulsion of vehicles (6,857—*124,736*)—O. Morize.
Mechanically propelled road vehicles (9,277—*137,708*)—L. Barrow, S. M. Scott, and Cadbury Brothers.
Hand steering wheels for motor vehicles (10,412—*137,716*)—F. H. Bluemel and Bluemel Brothers.
Rail anchoring devices (13,359—*137,741*)—W. J. Mellersh-Jackson (*P. and M. Company*).
Journal boxes (22,485—*137,780*)—E. C. R. Marks (*Nordiska Kullager Aktiebolaget*).
Turning and stopping signals for automobiles (905—*137,897*)—S. Cohn.
Variable speed gears for motor cars (4,475—*137,941*)—G. H. Jones.
Steering gears for motor vehicles (7,802—*137,965*)—G. H. Jones.
Car trucks (11,877—*137,990*)—E. Leclerq.
Wheels of motor vehicles (21,715—*138,042*)—G. Read.

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TRAFFIC RETURNS.

Tramway and Omnibus Undertakings in the United Kingdom.

NAME OF COMPANY OR CORPORATION.	1919. WEEKS ENDED.					1920. WEEKS ENDED.					AGGREGATE.		
	Feb. 1	Feb. 8	Feb. 15	Feb. 22	Mar. 1	Jan. 31	Feb. 7	Feb. 14	Feb. 21	Feb. 28	Wks.	1920.	Increase or Decrease.
	£	£	£	£	£	£	£	£	£	£		£	£
Aberdare U.D. Council	522	503	470	473	499	586	620	590	612	592	47	26,574	+ 2,602
Aberdeen Corporation	2,482	2,515	2,390	2,448	2,438	2,935	3,013	3,038	2,988	2,970	38½	125,380	+ 24,475
Ayr Corporation	391	391	397	387	396	455	469	488	454	472	41	28,339	+ 4,983
Barrow Corporation	608	590	572	586	593	728	711	744	734	743	8½	5,975	+ 930
Belfast City Tramways	946	...	54	4,829	7,657	10,361	10,608	10,828	10,761	10,723	48	495,607	+ 126,272
Birkenhead Corporation	2,053	2,022	1,946	2,058	2,088	2,982	2,988	3,003	3,078	3,004	42½	140,183	+ 35,738
Birmingham Corporation	23,306	23,409	23,356	22,872	23,998	26,649	26,996	27,254	26,941	26,885	48	1,246,760	+ 109,662
Birmingham Motor 'Buses	1,193	1,219	1,232	1,176	1,328	1,646	1,751	1,727	1,741	2,076	48	82,661	+ 14,262
Blackburn Corporation	1,589	1,620	1,685	1,662	1,766	2,039	1,938	2,037	2,176	2,093	48½	108,421	+ 23,902
Bradford Corporation	9,072	9,064	8,583	9,190	9,163	10,858	11,195	12,457	11,377	11,446	48	545,977	+ 102,049
Burnley Corporation	2,485	2,616	2,596	2,583	2,577	3,014	3,082	3,033	3,031	2,970	—	—	—
Burton-on-Trent Corporation	399	395	383	415	395	537	496	558	501	497	48	24,524	+ 4,689
Bury Corporation	1,935	1 949	1,962	1,983	1,915	2,194	2,264	2,334	2,371	2,341	47½	112,267	+ 14,530
Chatham and District	1,175	1,085	1,097	1 143	1,238	1,435	1,438	1,443	1,495	1,382	8	11,540	+ 1,871
Cork Electric	525	529	526	532	498	745	795	803	790	771	8	6,294	+ 1,889
Derby Corporation	1,403	1,403	1,402	1,423	1,416	1,970	1,921	1,973	1,955	1,920	48	93,344	+ 21,734
Dundee City	1,983	1,956	1,950	1,896	1,980	2,401	2,450	2,542	2,461	2,462	40½	103,709	+ 23,753
East Ham Corporation	1,486	1,537	1,542	1 519	1,535	1,738	1,787	1,764	1,754	1,710	47½	90,345	+ 15,720
Edinburgh Corporation	8,174	7,851	7,889	7,792	8,100	10,599	10,838	10,772	10,752	10,917	34½	380,396	+ 71,613
Glasgow Corporation	27,867	27,418	26,490	27,077	28,444	33,638	33,191	33,915	33,721	33,767	39½	1,265,751	+ 153,375
Glossop (Urban Elec. Supply Co.)	211	206	202	229	212	208	223	226	234	226	9	2,012	+ 140
Huddersfield Corporation	3,528	3,548	3,354	3,511	3,642	4,688	4,783	4,750	5,012	4,782	48	233,274	+ 52,946
Ilford U.D. Council	950	944	954	989	1,016	1,152	1,142	1,140	1,121	1,122	47½	56,546	+ 8,641
Ipswic Corporation	609	641	656	662	670	797	764	788	801	776	48	43,610	+ 8,087
Isle of Thanet	272	243	289	280	307	484	493	512	576	553	21½	11,234	+ 4,722
Kilmarnock Corporation	265	275	263	265	263	315	309	324	314	305	41½	12,125	+ 1,043
Lanarkshire	3,595	3,480	3,380	3,374	3,505	3,802	3,777	3,869	3,924	3,952	8	31,761	+ 1,443
Leeds City	13,735	13,649	13,243	13,464	13,986	15,972	16,281	16,045	16,277	16,359	48	788,897	+ 142,194
Leicester Corporation	4,863	4,744	4,744	4,813	4,859	6,058	5,965	5,956	5,862	4,900	—	—	—
Leyton U.D. Council	2,376	2,292	2,413	2,369	2,482	2,720	2,746	2,702	2,761	2,713	48	144,891	+ 36,082
Liverpool Corporation	19,359	19,244	18,762	19,438	19,769	25,101	25,599	25,180	25,680	25,709	8½	214,709	+ 49,357
London County Council	66,564	66,278	67,321	64,031	67,111	77,631	78,148	77,711	78,083	76,175	47½	3,761,881	+ 624,089
Maidstone Corporation	260	245	257	265	278	340	348	348	367	345	47½	18,293	+ 4,759
Manchester Corporation	26,535	26,758	26,475	26,325	26,144	30,181	29,336	30,531	30,985	30,748	48	1,451,534	+ 203,052
Newcastle-on-Tyne Corporation	8,162	7,943	7,705	7,761	8,155	9,048	9,210	9,211	9,003	9,238	47	449,705	+ 26,302
Northampton Corporation	...	...	...	...	...	...	...	...	...	...	—	—	—
Nottingham Corporation	5,832	5,813	6,274	6,202	6,424	7,313	7,217	7,128	7,307	7,166	48	342,181	+ 65,111
Oldham Corporation	3,378	3,459	3,487	3,449	3,483	4,233	4,492	4,569	4,653	4,610	47	217,004	+ 47,540
Reading Corporation	1,247	1,233	1,237	1,309	1,324	1,663	1,692	1,719	1,826	1,621	47½	76,870	+ 15,160
Rotherham Corporation	2,074	1,971	1,987	1,917	2,071	2,292	2,286	2,294	2,439	2,276	46½	101,730	− 6,021
St. Helens Corporation	...	...	...	...	...	1,663	1,666	1,678	1,717	1,711	21	32,648	—
Sheffield Corporation	12,368	12 529	12,247	12,347	12,558	19,118	19,541	19,514	19,340	19,823	48½	825,760	+ 183.688
Southampton Corporation	2.197	2,135	2.193	2,173	2,350	3,015	3,037	2 891	3,057	2,936	47½	132,054	+ 12,968
Southampton Motor 'Buses	...	...	...	...	...	179	185	186	201	189	30	4 523	—
Southend-on-Sea Corporation	1,032	969	1,020	1,022	1,112	1,388	1,416	1,406	1,476	1,400	48	96,195	+ 34,135
South Shields Corporation	1,157	1,180	1,131	1,164	1,192	1,407	1,432	1,453	1,444	1,440	48	68,472	+ 13,384
Sunderland Corporation	2,344	2,340	2,536	2,625	2,742	2,659	2,858	2,724	2,769	2,730	48	136,508	+ 29,879
Swindon Corporation	282	297	276	...	...	347	326	323	...	...	45½	16,412	+ 2,458
Tyneside Tramways and Tramroads	797	785	786	757	819	1,000	1,008	1,020	1,041	1,006	8	7,910	+ 1,308
Wallasey Corporation	1,879	1,838	1,774	1,840	1,886	2,158	2 199	2,229	2,276	2,238	47½	118,166	+ 28,178
Walsall Corporation	1,211	1,202	1,202	1,164	1,255	1,621	1,654	1,658	1,651	1,643	47	72,834	+ 13,363
Walthamstow U.D. Council	1,252	1,251	1,310	1,313	1,395	1,754	1,778	1,804	1,801	1,797	48	82,442	+ 14,001
Warrington Corporation	837	826	803	815	824	965	966	966	958	917	47	43,169	+ 5,881
West Ham Corporation	4,478	4,445	4,535	4,637	4,743	5,178	5,213	5,146	5,182	4,973	47½	252,224	+ 33,564
Wolverhampton Corporation	1,634	1,628	1,594	1,553	1,621	2,249	2,315	2,251	2,310	2,253	47	99,445	+ 18,792

Colonial and Foreign Tramway Traffic Returns.

NAME OF COMPANY.	1919. WEEKS ENDED.					1920 WEEKS ENDED					AGGREGATE.		
	Feb. 1	Feb. 8	Feb. 1	Feb. 22	Mar. 1	Jan. 31	Feb. 7	Feb. 14	Feb. 21	Feb. 28	Wks.	1920.	Increase or Decrease.
	£	£	£	£	£	£	£	£	£	£		£	£
Anglo-Argentine	54,769	58,942	60,269	57,780	58,997	66,014	67,136	71,665	72,346	76,209	8	557,612	+ 128,625
Calcutta Rs.	82,692	84,613	87,583	87,432	88,962	84,422	96,005	87,833	91,773	89,855	8½	678,425	+ 45,791
Madras Rs.	...	...	...	...	...	...	...	...	...	...	—	—	—
Pernambuco	5,497	5,397	5,098	4,879	5,421	8,107	7,959	8,402	8,475	7,872	8½	70,603	+ 24,686

Companies Issuing Monthly Statements only.

	1918.				1919.		1919.				1920.		Wks.	AGGREGATE.	
	Sept.	Oct.	Nov.	Dec	Jan	Feb.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.		1919-20.	+ or −.
	£	£	£	£	£	£	£	£	£	£	£	£		£	£
Ballarat & Bendigo	3,430	3,691	3,570	3,884	...	...	3,396	4,176	4,243	4,219	...	...	36	32,025	+ 1,049
Brazilian Trac. Mira	9081000	8052000	7581000	3531000	...	...	9792000	9980000	9796000	9739000	...	...	52	113074000	+ 11180000
Brisbane	35,400	...	...	...	38,575	...	41,970	...	...	...	44,800	...	4	44,800	+ 6,225
British Columbia $	575,476	580,354	612,893	591,065	...	677,483	684,946	710,405	733,981	783,324	...	829,709	30	5,050,625	+ 955,041
Buenos Ayres L'c'z.	...	41.843	42,952	50,460	41,556	42,429	...	49,692	50,635	55,873	52,642	52,468	34	398,687	+ 55,478
Burma	30,836	34,848	34,408	34,593	38,265	...	43,152	51,898	46,755	43,571	41,749	...	26	270,808	+ 56,003
Cape Town	...	...	...	...	...	...	...	...	...	...	26,009	...	—	—	—
Carthagena & H.	2,549	2,525	2,988	2,950	3,655	2,351	1,539	1,465	2,549	2,923	4,748	4,008	8	8,756	+ 2,750
East India	1,939	2,044	1,942	2,048	1,970	1,689	2,831	2,855	2,709	2,916	2,988	3,001	30	20,061	+ 6,449
Kalgoorlie	2,947	2,835	2,933	...	...	...	3,005	3,095	2,859	...	...	...	48	30,492	- 346
La Plata	4,999	5,177	5,334	5,792	5,730	...	5,540	6,196	6,240	6,324	3,155	...	4	3,155	− 2,575
Lima	42,838	...	44,910	...	...	...	48,780	...	52,086	...	...	...	48	531,788	+ 51,653
Manila $	204,500	214,898	214,292	236,612	...	...	223,048	241.949	247,599	276,000	...	...	52	2,597,090	+ 274,333
Monte Video	23,611	...	...	...	40,910	...	35,552	...	...	...	47,767	...	13	132,450	+ 21,401
Para	23,442	22,442	19,765	23,800	24,515	...	24,386	27,849	25,422	24,412	24,306	...	8	48,718	+ 403
Peruvian $	...	...	...	1057990	...	...	...	...	...	1310880	...	...	—	—	—
Port Elizabeth	...	...	...	...	...	...	...	...	...	...	7,827	...	—	—	—
Rangoon	6,067	6.566	6.611	6,188	6,373	...	6,812	7,679	7,379	5,717	7,467	...	4	7,467	+ 1,094
Toronto $	1119925	1048478	1071106	...	...	1106640	1124159	1123801	1111177	...	...	1130485	4	1,130,486	− 23,646
Winnipeg $	285,670	295,005	260,601	...	...	390,539	351,248	428,339	423,826	...	...	498,837	4	498,83.	+ 102,298

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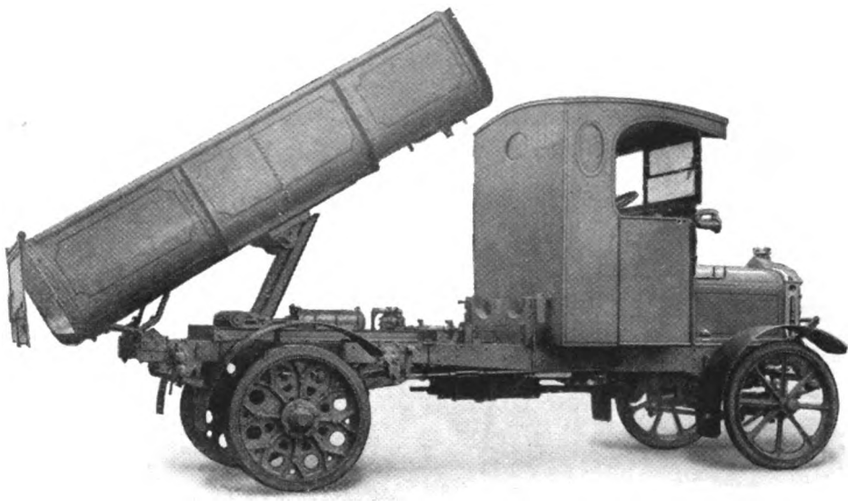

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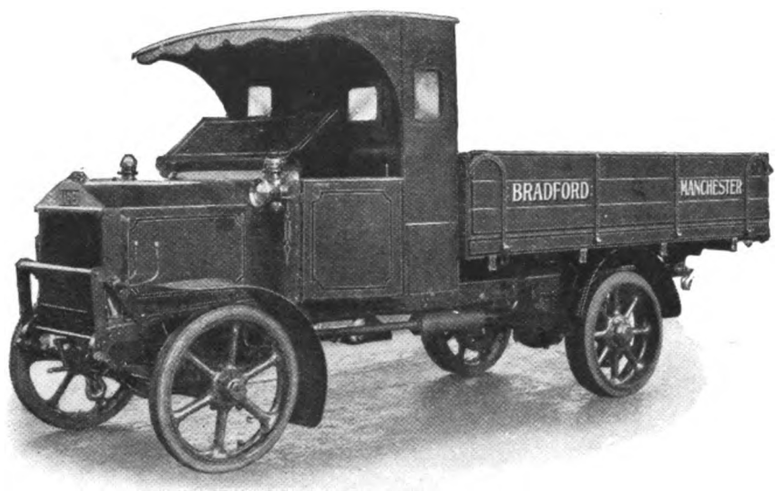

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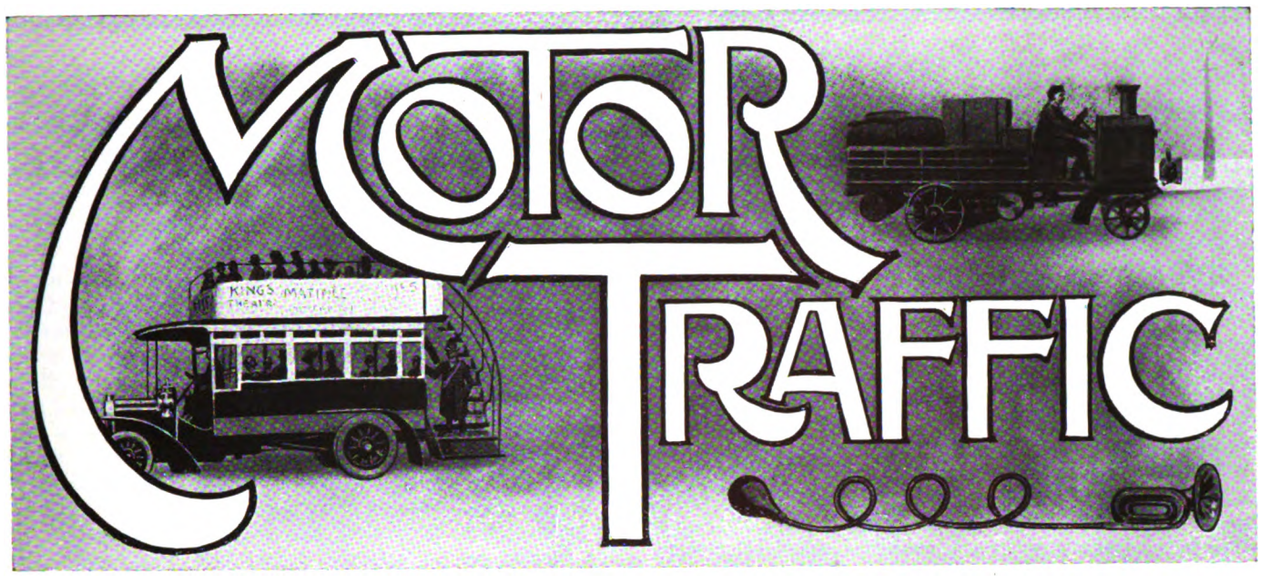

THE FUEL PROSPECT.

Although the contention of the petrol and benzole organisations that the Profiteering Sub-Committee have suggested an impossible price at which fuel should be sold may ultimately be proved by the facts of the case, the Committee evidently have no doubt of their judgment. This difference of opinion makes it the more necessary that the proposal that European Governments should take concerted action through the Economic Section of the League of Nations on the question of price should receive consideration. There is unquestionably a necessity for a reduction of the price of petrol from 3s. 8½d. The chief difficulty is that this country imports 95 per cent. of its petrol, and that other countries are similarly situated, but the Sub-Committee consider it improbable that a fair and reasonable price would result in restriction or cessation of the supply. To secure effective action would be difficult unless rationing were enforced. An encouragement towards such an enactment is given by the statement of the managing director of the Asiatic Petroleum Company that if the Governments are agreed to apportion the supplies among themselves, the price will come down. Another ray of hope from the same authority is that increased freight facilities from the shipyards will reduce the retail price. A distant satisfactory outlook is to be found in a statement by the chairman of the Anglo-Persian Oil Company that they hope by the end of 1922 to place on the British market 500 to 600 tons a year, equal to 80 per cent. of the present consumption. Concerning this company Parliament ought to require from the Government an explanation of the reason why their acquisition of a controlling influence was accompanied by an agreement that until 1922 they are not to sell any of the products of the company in this country. In taking action upon the Sub-Committee's report, the Cabinet ought not to place too much reliance upon the statement of the Anglo-Persian Company that at the end of 1922 they hope to provide this country with 80 per cent. of its present consumption. The necessity of guarding the Persian wells was one of the reasons why an expensive campaign had to be undertaken, and in territories so unsettled it is not unlikely that the oilfield may be the centre of further trouble.

* * * *

All things considered, the most practical recommendation of the Committee is that in which they advocate the taking of measures to encourage home and Empire produced power alcohol, and its control by the Government in order to prevent the setting up of a monopoly such as exists in the case of petrol. This question has already been reported upon by an inter-departmental committee; but there is scope for wider treatment at the hands of the Fuel Research Board, which has since been called into existence. The question was first broached at the sittings of the Imperial Motor Transport Committee held in London a year prior to the outbreak of the war, when attention was called to the vast quantities of waste material which could be converted into fuel alcohol. A few days ago the South African representative of the Federation of British Industries asserted that South Africa has vast deposits of cheap coal for the manufacture of benzol, and that large quantities of alcohol can be produced from sugar waste and maize. Combined with a statement as to General Smuts' anxiety to attract capital to that vast country, that fact ought not to be lost sight of by British capitalists. Whatever course of action the Government may decide upon when they have the Fuel Research Board's report before them, the scope for private enterprise is likely to be unlimited in view of the vast extent of territory available for alcohol production. The difficulty will be to co-ordinate control by the respective local Governments with the giving of encouragement to the producers.

OMNIBUS AND COACH TRAFFIC.

If an analysis were made of the undertakings carrying on public passenger and pleasure traffic by coaches and omnibuses, it would be found that the majority are due to the enterprise of municipal and privately owned tramways. It is natural that such should be the case, for single operation of the means of passenger transport brings advantages both to the owners and to the public. The operators receive increased receipts by both forms of traction, while the public gain access to many places that could be reached only by inconvenient railway journeys. In addition, they are encouraged to indulge in pleasure trips to near and distant localities. In London these facilities are available all the year round by the double-deck omnibus, which on Saturday afternoons and Sundays are to the general public what the private car is to well-to-do people. Similar patronage is bestowed upon omnibuses running from tramway termini of provincial towns. Numerous tramway companies have ventured upon running the more popular coach or char-a-bancs,

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MOTOR TRAFFIC

notably the Bristol Company, which has the distinction of being pioneers of this class of traffic, their vehicles running to all parts of the kingdom. As yet the only Corporation tramways undertakings owning coaches appear to be Birkenhead and Edinburgh, whose operations are restricted to short trips, open to all comers. Their popularity at the Scottish capital, combined with the delay in electrifying the cable tramways owing to the economic difficulties, has induced the Corporation to acquire thirty single-deck omnibuses consequent upon the recommendation of the manager that the cable car service on the northern routes should be scrapped. Tramway operators who have not yet embarked on coach traffic will find useful information in "Touring by Motor Coach," a 72-page publication issued by the Lancashire United Tramways, Limited. The project was inaugurated on a small scale in 1914, but was interrupted by the impressment of the Dennis coaches for war service. Resumed in 1919, the services attained such popularity that by the autumn twenty-four vehicles were running. This year's additions to the fleet, together with the opening of a large garage in Liverpool, will render the business one of the largest in the country. One reason of the popularity of coach traffic is that the vehicles are designed for passenger carrying only; therefore they are more comfortable than chassis built primarily for goods carrying during the week, as is the case with many owners who engage in week-end pleasure trips. The publication shows that the business has been developed on well-organised lines. The short trips and extended tours are advertised in the local newspapers, and booking offices exist in various centres. In addition a representative calls upon intending patrons to supply particulars and information. The efficiency of the service is shown by the fact that last summer a party numbering 750 were secured for a day trip. Further evidence that the industry are awake to the importance of this traffic is shown by the Torquay Tramways Company being about to place ten omnibuses on an interurban service, which will eventually embrace Exeter, Brixham, etc. If further incentive is needed we may point to Pickford, Limited, "Seeing Britain" enterprise, which was originated last year with comfortable petrol-electric coaches.

SHORTAGE OF PRODUCTION.

Two years before the war the manufacturers of commercial and public vehicles were advised in these columns to lose no time in enlarging their works, so as to be in a better position to meet the inevitable increase in the demand for their products in the next few years. Then the war came, bringing with it the necessity of increasing the supply to an extent that could not be met by existing plants. Consequently makers of private cars had to be employed in constructing heavy vehicles, and while existing firms specialising in the latter type were enlarging their factories, hundreds of American machines had to be obtained. With the advent of the armistice the various British firms, notwithstanding their increased facilities, were unable to give delivery in reasonable time of orders that poured in from public bodies and private firms. This rush of business had been held up during the four and a half years of hostilities, when the makers were permitted only to execute orders for vehicles needed to assist in war contracts. Besides this pent-up demand there is another cause for the flood of orders, upon which little impression has been made by the thousands of machines turned out at the Government repair works at Slough.

* * * *

The second reason referred to is to be found in the resort to mechanical traction in order to meet the higher cost of labour and forage. Local authorities are particularly affected by this cause, and it is safe to assert that by the end of this year very few will not have adopted motor haulage for such work as road making, refuse removal, or the transportation of coal and clinkers. At the present time there is probably not a County Council without its own steam and petrol wagons, and in all of the great cities and towns such vehicles have expanded into fleets. In view of the foregoing considerations it is not surprising that further extensions of works are going forward. New buildings which Guy Motors, Limited, are erecting on part of sixty acres of land which they own at Wolverhampton will enable their output of commercial and private cars to be more than trebled. It is significant also that several manufacturers are devoting increased attention to the renovation of their vehicles which have seen war service. Recently we mentioned the purchase by Leyland Motors, Limited, of a thousand of their machines from the Royal Air Force, and the acquisition of an aviation factory at Richmond for the purpose of restoring them to a first-class condition. Now comes the news of the purchase of 2,550 of their lorries which have become surplus to army requirements at Cologne by the Albion and Maudslay companies for renovation at their respective works. Owners who acquire such vehicles as these will be after overhauling will have bargains, for the managing director of the Albion Company has stated that they have not undergone exposure.

STANDARDISATION.

Halifax Corporation has established a Transport Committee which recently reported in favour of the standardisation of motor vehicles and the substitution of motors for horsed vehicles. The committee were asked to give further consideration to these subjects, and now re-affirm their previous proposals. It is the intention of the committee to standardise motor and other vehicles as far as is possible and consistent with the general efficiency of the department. The object of the committee will be to co-ordinate all the haulage and carting requirements of the various departments with a view to securing the greatest efficiency at the lowest cost. There is no intention to interfere with or in any way control the work of the other committees. The desire is to secure that all vehicles shall be used to the fullest of their capacity without overlapping. This object will be attained by the co-ordination of the requirements of the various committees to the transport officer in such a way that vehicles leaving the yards fully loaded may by arrangement return loaded rather than empty to the various departments. The committee have made inquiries from numerous towns, and find that several are working towards the proposals now recommended. Oldham Corporation appears to have made the greatest advance in this direction. In this case the committee is responsible for all the motor vehicles, horses and carts, inclusive of all team labour and carrying work required by the Corporation's departments, and at present is considering the erection of a central garage and workshop for all repairs and renewals.

COMMERCIAL MOTOR PARADE.—The annual parade of commercial motor vehicles, organised by the Commercial Motor Users' Association, with the object of encouraging drivers to take a personal interest in the driving and condition of their vehicles, and to run them without accident, will be held in London on April 10. Entries for the "Team Section" include eighteen firms, fifteen of whom will show the minimum six vehicles, while the Gas Light and Coke Company will exhibit 54; Schweppes, Limited, 18; and Pickford's, Limited, 12.

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MOTOR TRAFFIC

MOTOR FUEL PRICES EXCESSIVE.

REPORT OF THE PROFITEERING ACT SUB-COMMITTEE.

POWER ALCOHOL AS SUBSTITUTE.

The Sub-Committee appointed by the Standing Committee under the Profiteering Act to investigate costs, prices, and profits in respect of motor fuels, have presented their report to the Standing Committee. The members of the Sub-Committee are—Sir Wilfred Stokes (chairman), Sir John Cadman (representing the Petroleum Executive), Mr. P. G. L. Webb, Mr. F. Chitham, Mr. Walter Wolsey (representing Commercial Motor Users' Association), Mr. J. Taylor (representing Midland Traders' Federation), Baillie P. Gillespie (representing Horse and Motormens' Union), Mr. S. March (representing National Vehicle Workers' Union), Captain R. H. Montgomery (representing the Automobile Association).

THE SUB-COMMITTEE'S FINDINGS.

Appended are the findings of the Sub-Committee—

(1) The present New York f.o.b. price of petrol is excessive.

(2) The price of petrol f.o.b. New York is, by arrangements amongst the distributing companies, taken as the basis of the price for all motor spirit coming to Great Britain from whatever source of origin, and the rate of exchange ruling as between here and the States operates against us in all countries on cargoes purchased, from whatever source.

(3) The tank steamers engaged in the United Kingdom trade are owned principally by the distributing or producing companies, or else by companies whose capital is held by the distributing or producing companies.

(4) The rate of freight from the Atlantic or Gulf ports to the United Kingdom should not exceed 100s. per ton.

(5) There are understandings between the principal distributing companies in the United Kingdom as to prices.

(6) These distributing companies importing petrol into this country do not produce petrol themselves, but are subsidiary companies, formed or acquired by producing companies or financial groups owning producing companies.

(7) The retailers' profit should not, under present conditions, exceed 4d. per gallon, irrespective of the retail price.

PROPOSED PETROL PRICES.

(8) As the companies producing petroleum, owning and distributing motor spirit, are so intimately allied, their interests are closely interwoven, and the retail price of No. 1 petrol should be fixed for the present at 2s. 10½d., made up as follows—

	d.
Duty	6
Distribution charges	6·197
Garage remuneration	4
Freight	4
Marine charges, including insurance, ocean leakages, etc.	·200
Profit on distribution, making liberal allowance for profit	1·5
Cost of production, making liberal allowance for profit	10·00
Add rate of exchange	2·5
Per gallon	34·397d.

(9) The price of No. 3 petrol shall be fixed at 2s. 8½d. per gallon.

(10) The Government should control tonnage, distribution, and production, when within its jurisdiction.

(11) Attempts should be made to bring about international agreements, in order to secure unity of action, for mutual protection against excessive prices.

(12) The present import duty of 6d. per gallon should be retained.

SUGGESTED PRICE FOR BENZOL.

The findings of the Sub-Committee with regard to benzol are—

(1) The price of benzole is regulated by agreement amongst the producers through the National Benzole Association.

(2) The benzole producers have fixed the commission to the garages at 5d. per gallon, but this is excessive, and should be fixed at 4d. per gallon.

(3) The price of benzole or any spirit containing or admixed with benzole and/or toluol should be fixed at 2s. 8d. per gallon, made up as follows—

	s.	d.
To producers, including profit	1	4
To refiners...	0	6·5
Cost of distribution	0	5·5
Remuneration to garages	0	4
Per gallon	2	8

(4) The export of benzole and/or toluol should be prohibited.

RECOMMENDATION AS TO POWER ALCOHOL.

Measures for mitigating the effects of a possible world-shortage of supplies are suggested in the Sub-Committee's general findings, which are given below—

(1) There is a grave danger of a permanent world-famine in motor spirit, even at fabulous prices.

(2) The sole remedy for this country is a largely increased production of home and Empire produced motor fuel.

(3) Power alcohol is the only potentially unlimited source of supply.

(4) The Government should use every possible means to foster the production of power alcohol, and place no restriction on the production and use of power alcohol in this country.

(5) The use of bulk storage for all kinds of motor fuel would very materially reduce the cost of distribution, and that the Government should give special attention to this point.

(6) No fuel used for internal combustion engines for traction purposes be sold in excess of the price for the time being fixed for petrol, except the special grade of petrol sold for aviation purposes, when the price should not exceed the price fixed for No. 1 petrol for traction purposes by more than 4d. per gallon.

(7) The price of packages for any kind of motor spirit shall not exceed the following—Two-gallon tins, 3s. each; 50-gallon drums, £3 10s. each; unless there is any substantial increase in the cost of manufacture.

(8) No motor spirit imported into this country shall be allowed to be re-exported.

(9) Pending any decision as to the constitution of a special body to control the production, transport, and distribution of motor spirit, the above findings as to prices and export should be put into force forthwith.

RESERVATIONS TO THE REPORT.

The signature of all the members of the Sub-Committee are affixed to the report, but the following reservations are appended—

Mr. J. C. Clarke, who represented Sir John Cadman, of the Petroleum Executive, at the meetings of the sub-committee—"I cannot entirely concur with certain of the findings as to conditions in the petroleum trade, and I hope that very careful consideration will be given by the Board of Trade to the question of prices before deciding to enforce the large reductions suggested. I am strongly in favour of any effective means of securing cheaper motor fuel, but I am of opinion that the position of this country will be seriously prejudiced, particularly in the event of the world shortage anticipated by the sub-committee, by a refusal to pay as much as its competitors for the available supplies, while so large a proportion continues to be produced in foreign countries."

Mr. Walter Wolsey and Mr. P. G. L. Webb—"We are in agreement with this report except so far as it recommends the fixing of prices for petrol; this we only agree to subject to the Government arranging for similar action by Governments of other European countries."

The Standing Committee have forwarded the report to the President of the Board of Trade.

SALE OF ARMY LORRIES.

THE DISPOSAL BOARD'S IMPROVED POLICY.

According to a statement made in Parliament, the Disposals Board at this late period have adopted the method of selling at the parks on the western front motor lorries which become surplus to the army's requirements. In reply to a question put to him on March 2, Mr. Kellaway said—Motor lorries in Germany are notified to the Disposals Board for sale from time to time as and when they become surplus to requirements. They are sold in accordance with the general policy of the Board for the highest price obtainable. All the lorries disposed of up to the present time have been sold to British firms, and an equal opportunity of purchasing the vehicles is afforded to all British private firms of financial standing. I am informed that the total number of lorries in the motor transport parks at Aachener and Bickendorf Aerodrome (Cologne) on February 1 was 3,300, of which 2,550 have been notified to the Disposals Board by the War Office as surplus to requirements. I understand that there were no lorries in Veleor Strasse. Of the 2,550 surplus lorries, 716 have been sold to Messrs. Maudslay Motor Company, and 200 to Messrs. The Albion Company. The total sum realised was £334,400. A further 562 of the surplus lorries have been despatched to this country for repair. The average price obtained for vehicles sold *in situ* in Cologne is £387 per lorry, the purchaser bearing all expenses in connection with removal, custody, transport, and so on. Six hundred and sixty-six Thornycroft lorries were recently sold in Cologne by the Disposals Board. They were purchased by Messrs. Maudslay Motor Company at an average price of £400.

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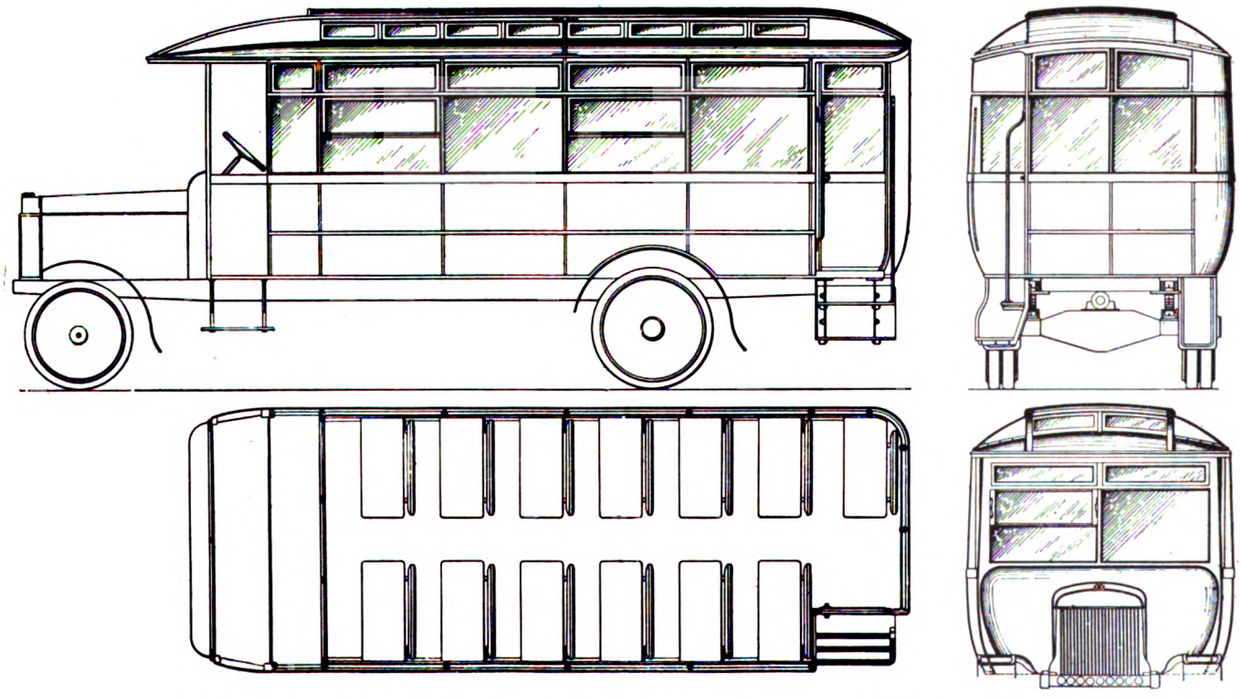
NEW SINGLE-DECK OMNIBUS FOR SHEFFIELD.

Sheffield Corporation Tramways and Motors Department are gradually extending their omnibus services, and to supplement the present fleet the Tramways Committee, on the recommendation of the general manager, Mr. A. R. Fearnley, have advised the purchase of five single-deck omnibus bodies, fitted with clerestory roofs, from Christopher Dodson, Limited, of Willesden, London, N.W.

The elevation and plan of the body is shown in the accompanying drawings, together with a complete vehicle fitted with an A.E.C. chassis. As will be seen from the drawings, the vehicle is fitted with transverse seats, and the passengers enter by a side door at the rear. The driver is provided with a cab, and in his compartment there are seats also for three passengers. The total seating capacity of the vehicle is 37, made up as follows:—Three passengers in the driver's compartment, 26 fixed seats inside, an automatic tip-up seat in the rear providing seats for two passengers, and six other automatic tip-up seats in the aisle.

Side View of Single-Deck Omnibus for Sheffield Tramways and Motors Department.



Plan and Elevations of Dodson Single-Deck Omnibus Body for Sheffield Corporation.

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DENNIS TOWER WAGON.

The accompanying illustration shows a motor tower wagon delivered by Messrs. Dennis Brothers, Limited, of Guildford, to the St. Helens Corporation. As this vehicle was an exhibit by Messrs. Dennis at the Roads and Transport Exhibition, readers may be interested in the details of what is considered to be one of the finest examples of such a machine in the country.

The framework is of oak with steel panels, four tool-boxes, and driver's seat of ample space. Towers are of oak, well braced and

bolted together. The elevating gear is the Rawlinson central screw type, operated by one man. The platform is of the revolving type, with toothed rack, and can be set at any angle and operated from the top. A tool-box is fitted to platform and folding guard rails. When fully extended the height from the floor of the platform is 19 ft., and the closed height is 13 ft. 10 in.

The engine develops 40 H.P. at 1,000 revolutions per minute. The cylinders are cast in pairs, bore and stroke being 115 × 150 mm. and the carburetter is of the Claudel-Hobson type with gravity feed. The radiator is mounted on rubber-lined trunnions, and the portions carrying the tubes can be easily dismounted from the top and bottom headers. The radiator is adequately protected from damage through collision by means of guard stays and a cross tube.

Lubricating oil is forced to the working parts of the engine by a pump; a large oil sump at the bottom of the crankcase carries a sufficient supply of oil for 3,000 miles. A detachable cover is fitted at the bottom of the sump to facilitate cleaning. The throttle and ignition levers on the steering column, and the clutch brake and foot accelerator pedals are all of War Office pattern. The gearbox is a special metal casting fitted with a large cover giving maximum opening, and there is a smaller cover quickly detachable for the introduction of lubricants. The gear shafts run on ball bearings. Arrangement of the gears is extremely simple; all four speeds and reverse are obtained with two selector rods only. The gears are of chrome nickel steel, and are of such width and pitch as to ensure long service. The shafts are splined, and are of large diameter. Selector rod ends are provided with a neat and simple serrated adjustment. The four forward speeds give approximately 3½, 5¾, 9½, and 16 miles per hour at an engine speed of 1,000 revolutions per minute. The reverse gives 3½ miles per hour.

A very special feature of the chassis is the thrust cross member. It is mounted on rubber-enclosed trunnions, which take all thrust and torque loads, and on that account it is much superior to the usual arrangement, which is quite dead and rigid, allowing of no flexibility. The load is applied through a large spherical head permitting of perfectly free movement. A large diameter torque tube acts also as a radius rod, connecting the ball-head with the rear axle, and completely enclosing the propeller shaft.

The back axle is contained in a steel casing, which carries the weight of the vehicle, and the power is transmitted to it through special high-efficiency Dennis worm gearing. The top cover of the steel casing is easily removable without taking down the axle or the wheels. When removed, it carries with it the worm, the worm wheel, and the differential gear. The live axles themselves can be easily withdrawn without removing the wheels or jacking up the chassis.

There is a foot-brake of the contracting type. It is of large diameter, has an ample area of wearing surface, and is situated behind the gear box. The hand brakes are of the expanding type, and are compensated.

Steel wheels are provided, the front tires measuring 880 × 120 mm. and the back 1,050 × 120 mm. the latter being twin. Dunlop tires are fitted as standard. Other details are appended.

Weight of chassis	approximately	3 tons	3 cwts.
Length overall		20 feet	5 ins.
Width		7 ,,	0 ,,
Wheel-base		13 ,,	0 ,,
Dash to end of frame		15 ,,	10 ,,
Width of frame		2 ,,	8½ ,,
Track		5 ,,	6 ,,
Height laden		3 ,,	0½ ,,
Turning circle		42 ,,	6 ,,

Mr. L. C. F. Bellamy, M.C., the general manager of St. Helens Corporation Tramways, expresses himself as highly pleased with the tower wagon from every point of view.

TILLING-STEVENS DEMONSTRATIONS.

PETROL-ELECTRIC FEATURE OF THE SCOTTISH SHOW.

In connection with the recent Scottish exhibition at Glasgow, the street demonstrations given by the single-deck omnibus shown by Tilling-Stevens, Limited, were a centre of attraction. Although widely used in passenger and commercial traction, the petrol-electric vehicle still has a great field to conquer, and there can be no better means of doing so than by runs similar to those given in the neighbourhood of Kelvin Hall.

It is perhaps in passenger conveyance work where the advantages of petrol-electric propulsion over gear-driven vehicles are most appreciated. The absence of gear and clutch—with their attendant jerk—is a feature that, while making for the comfort of passengers, is also reflected in low maintenance charges, owing to the even and smooth running. Simplicity of operation and safety are other features of the petrol-electric, it being the easiest vehicle to drive;

Irish City's Trial of the Petrol Electric.

and owing to the absence of clutching on hills, it is impossible for it to get out of control.

On this page is given an illustration of the single-deck omnibus constructed for Londonderry Corporation. It is mounted on a 3-4 ton chassis. There is a rear entrance for passengers, the

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MOTOR TRAFFIC

driver entering at his own end, where he is given complete shelter. Providing seats for 29 persons, the saloon may be referred to as one of the best lighted to be found in single-deck construction, while its moderate weight contributes to low running cost. Five let-down windows are provided on each side of body. Front and rear windows are of plate-glass bedded in rubber glazing strips. Louvre windows are hinged, and fitted with sheet steel flaps to prevent draught. The wind-screen has brass fittings and hinged pane for driver. Spring-back type seats are provided; cushions and seat backs being upholstered in leather. All necessary ascending handles are of solid brass. Mud-guards, front and rear, are well ironed up and made of lead-coated steel and wired with beaded edges. The rear entrance consists of two doors, opening inward, and a partition separates the rear portion of body. The body frame is of best quality ash, properly ironed up. The panels are of first quality dry mahogany, canvassed and pinned, with beaten steel panels where necessary, and all joints are finished with half-round mouldings. The interior and roof is lined out with three-ply birch. Waterproof canvas laid in white lead covers the roof, the underside of which is varnished in natural wood. The external decoration can be done to order.

Recent orders received by Tilling-Stevens, Limited, include one from Wolverhampton Corporation for seven omnibuses with Tilling-Stevens chassis at an estimated cost of £12,000.

ROADS AND TRANSPORT EXHIBITION.

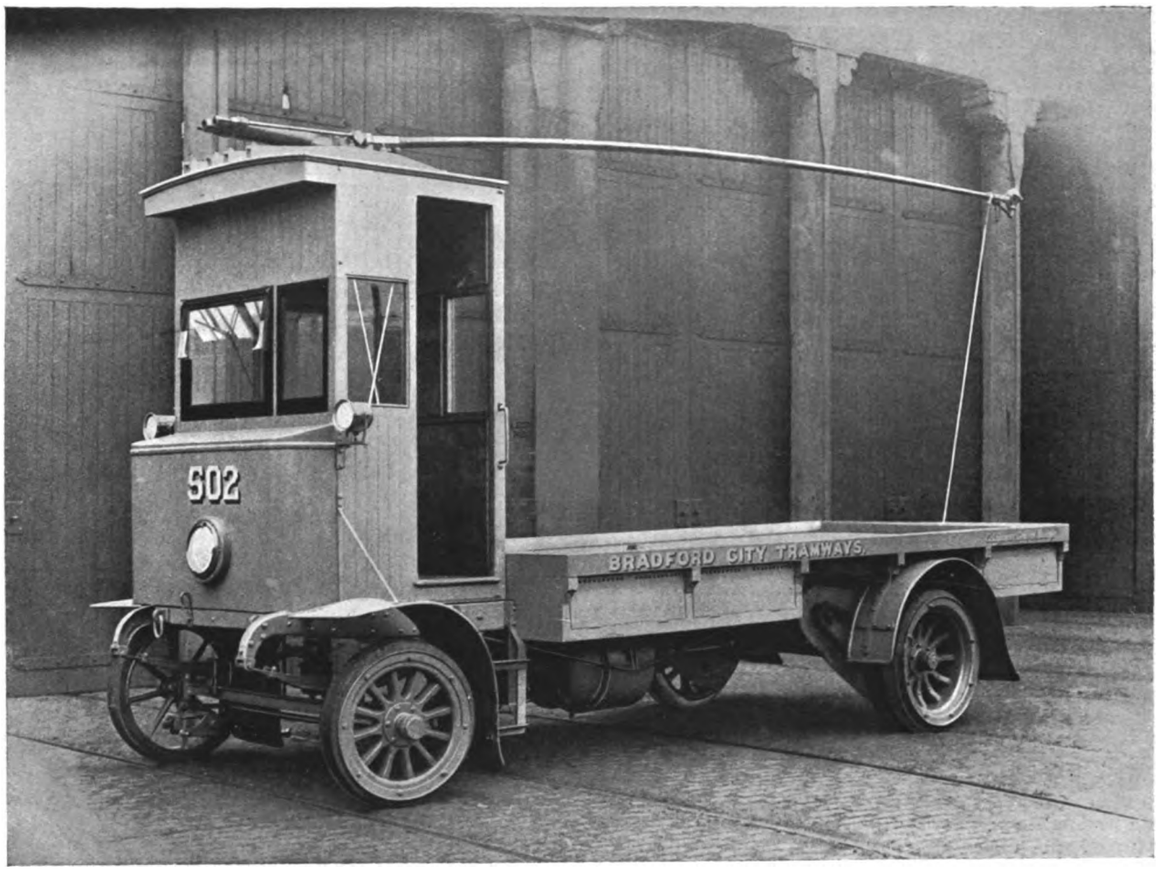
Mr. A. F. May, business manager of the recent Roads and Transport Exhibition organised by the County Council's Association, has presented his report on the exhibition to the association. He states that 90 firms were represented, and declares that the results were in every way satisfactory. The exhibits were of a very representative and interesting character. The turnstiles registered 24,259 admissions. He was informed by the exhibitors that the business transactions fully justified the expense incurred by them, and that they greatly appreciated the opportunity provided by the association. During the exhibition he received from the exhibitors a large number of inquiries as to the holding of a future exhibition, and he consequently issued a questionnaire

To the questionnaire he received 66 replies, of which 40 were in favour of an annual exhibition, 18 every two years, and six did not vote. With the exception of two, all replies indicated that the exhibition had been satisfactory from their point of view.

RAILLESS BATTERY VEHICLES.

OPERATING COST IN LEEDS-BRADFORD PARCEL TRAFFIC.

We are indebted to Mr. R. H. Wilkinson, general manager and engineer, of Bradford Corporation Tramways, for a table giving detailed cost of the operation of a railless battery vehicle. It makes two journeys per day between Bradford and Leeds, which is nine miles away. It is capable of carrying a load of 50 cwts., and runs between the ordinary service cars without causing any obstruction. The energy is taken from the overhead wires, and returns through the rail by means of a contact shoe.



Railless Battery Vehicle Used on Parcel Service Between Bradford and Leeds.

During the twelve months it has been on this service it has only broken down once, involving a delay of two hours. The expenses as set out in the appended table have been arrived at on a similar basis to that of the general working of our Bradford railless cars, so that the vehicle bears its proportionate share of all costs in connection with the undertaking, and its full and proper share of the expenses of the department. No charge has been made against this vehicle, however, for the maintenance of roads, which in the case of railless passenger vehicles amounts to ⅜d. per mile run.

The economy of operation in the case of the railless battery vehicle also applies to the railless passenger vehicles, to which Mr. Wilkinson made allusion at the conference of the Municipal Tramways Association at Dundee in September last. Mr. Wilkinson's remarks and figures then given will be found on page 223 of our October issue.

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MOTOR TRAFFIC

The railless vehicle is shown in the appended table of operating costs to be very economical, and to compare in this respect favourably with the petrol omnibus.

OPERATING COST OF RAILLESS BATTERY VEHICLE.

Details of Costs.	Per Car Mile, Nov. 4, 1918, to Mar. 31, 1919.	Per Car Mile, April 1, 1919, to Sept. 30, 1919.	Per Car Mile, Nov. 4, 1918 to Sept. 30, 1919.
Superintendence (*a*)	·019	·027	·023
(Actual) Wages of Motormen and Attendant	5·776	9·257	7·737
Cleaning and Oiling ..	·282	·399	·348
Fuel, Light, and Water ...	·132	·170	·153
Uniforms*	·183	·331	·267
Miscellaneous	·100	·118	·110
General Officers Staff (Proportion)	·225	·329	·284
Administration Expenses—(Proportion)	·030	·034	·032
Stores	·011	·039	·027
Rates and Taxes	·185	·212	·201
Printing and Stationery ..	·045	·064	·056
Fuel, Light, and Water for Offices	·018	·025	·022
Claims and Compensation ..	·029	·045	·038
Fire and other Insurance ...	·016	·015	·016
Miscellaneous	·053	·084	·070
Electrical Equipment of Line	·042	·041	·041
Buildings and Fixtures ...	·026	·061	·046
Workshop Tools, etc. ..	·032	·059	·047
Repairs (*b*)*	·717	2·152	1·525
Tires*	·750	·750	·750
Electricity*	1·116	1·122	1·119
	9·787 or £90 9 0	15·334 or £182 16 0	12·912 or £273 5 0
Interest on capital (excluding Permanent Way) ..	·355	·409	·385
Contribution to Sinking Fund (*c*)	·375	·417	·399
	10·517 or £97 3 11	16·160 or £192 12 11	13·696 or £289 16 10
Mileage	2,218	2,861	5,079
Units	2,200	2,362	4,562†

* Actual costs. †·898 units per mile.

(*a*) This cost does not include any charge representing a contribution to maintenance of roads.

(*b*) The amount charged for repairs includes renewals of accumulators and axles recently incurred.

(*c*) Financial charges are based on the whole of the annual charges for interest and sinking fund of the tramways undertaking, with the exception of permanent way.

STANDARD TENDERS FOR MOTORS.—At a meeting of the Executive Council of the County Councils Association, consideration was given to a letter from the Association of British Motor and Allied Manufacturers inquiring whether the County Councils Association would be prepared to discuss the question of the advisability of preparing a standard tender form for use in connection with the supply of motor vehicles to highway authorities. The Executive Council decided that in view of the great divergency in the requirements of highway authorities in regard to motor vehicles, they did not consider that a standard form of tender would serve any useful purpose.

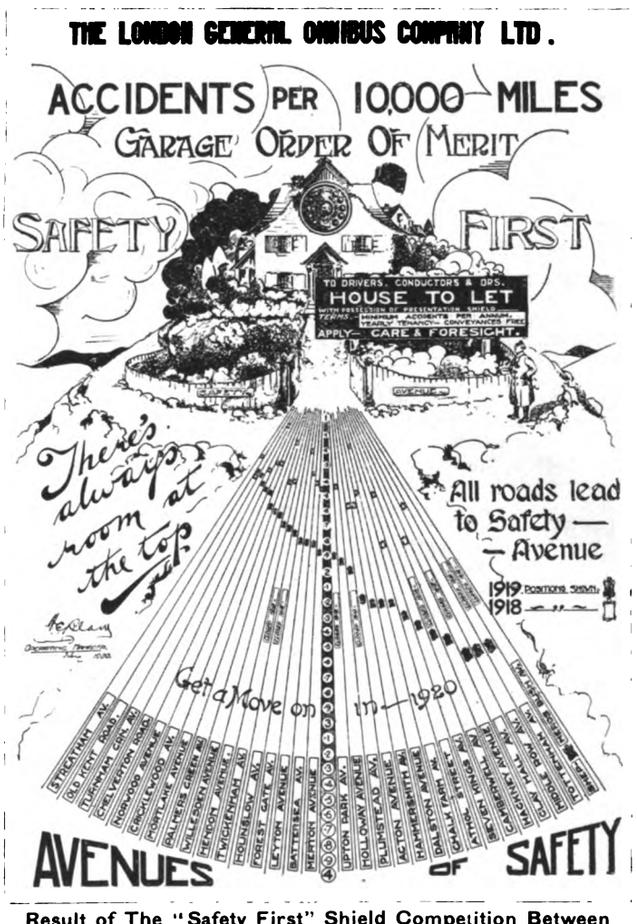
TRAFFIC IN WHITEHALL.—The police and the Traffic Advisory Committee have prepared proposals for reorganising the traffic of Whitehall, including the abolition of nine existing refuges and the construction of 12 new refuges. Reporting on the proposals, the Highways Committee of Westminster Council state that the scheme is for the diversion of traffic by means of central refuges, and for each half of the roadway to be further divided where it is wide enough by secondary refuges, making three abreast The scheme has been put forward owing to the Government insisting, against the advice of the Ministry of Transport and the City Council, in adapting the centre of the highway for the erection of the permanent cenotaph. Apart from that view, the Whitehall traffic, we may add, badly needs attention, for apparently more persons are killed there than in any London thoroughfare. Speed is the most dangerous factor.

MUNICIPAL OMNIBUS POWERS.

Reporting to the Essex County Council, the Parliamentary Committee state that the situation created by the promotion of Bills of Powers to run omnibus services has been discussed by a conference of representatives of Middlesex, Herts, and Essex County Councils. The conference were of opinion that it was desirable that the Essex County Council should empower the Herts County Council to include in their Bill power to run omnibuses in Essex until such time as the Essex County Council could obtain such powers to operate by means of a joint committee or otherwise. The Committee cannot recommend the Council to seek powers to run omnibuses either directly or through the Hertfordshire County Council.

BRIGHTON-HOVE OMNIBUS LEASE.

Instead of establishing omnibus services, Brighton and Hove Corporations have arranged terms with Messrs. Tilling, Limited, and an agreement has been approved by the Corporations and the company. This provides that for a period of seven years from July 1, 1919, the company will pay each Corporation an annual sum of £40 per vehicle in respect of a minimum of fifty omnibuses to be licensed, and £20 per annum for each omnibus over that number. The company are to provide a service over routes specified and such others as may be from time to time agreed upon. The times and fares will be as at present, but may be altered as agreed from time to time, and material increases and decreases in costs of running are to be deemed to be good causes for increasing or decreasing the fares as the case may be, subject to arbitration in case of disagreement. No compensation is to be paid to the company on the termination of the agreement. During the term of the agreement the Corporations will not exercise their running powers, nor lease them to any other party, but are not prevented from licensing other parties to run omnibuses to places outside the boroughs other than Brighton, Hove, Patcham, Rottingdean, Portslade, and Southwick, at fares exceeding the company's fares.


THE LONDON GENERAL OMNIBUS COMPANY LTD.
ACCIDENTS PER 10,000 MILES
GARAGE ORDER OF MERIT
SAFETY FIRST
TO DRIVERS, CONDUCTORS & OPS.
HOUSE TO LET
APPLY— CARE & FORESIGHT
There's always room at the top
All roads lead to Safety — Avenue
1919
1918
Get a Move on in 1920
AVENUES OF SAFETY

Result of The "Safety First" Shield Competition Between London Omnibus Garages.

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MOTOR TRAFFIC

THE PROCESS OF IGNITION.

Problem of Starting Commercial Vehicles.

In the course of a paper on "The Process of Ignition," by Messrs. A. P. Young and H. Warren, read before the Institution of Automobile Engineers, the authors said that successful carburation depends on securing in the cylinder at the moment of ignition a charge that closely approximates to a perfect combustible. It is of little practical use to consider the action of a carburetter in conjunction with a fuel to which it is ideally suited, for at the present time most carburetting systems have to handle fuels which differ considerably in physical properties from those for which they were designed. This is owing to the fact that for some years now fuels have been growing steadily heavier, and boiling points have been getting steadily higher.

A leading carburetter expert recently remarked that carburetters do very little true "atomising" or vapourising, but particles of petrol are torn off at the jet, and the vapourising is principally a subsequent process. The carburetter may be looked upon mainly as a mixing device, and most of the vapourisation may be assumed to take place in the induction manifold, and, finally, in the cylinder itself.

The Starting Problem.

In the foregoing discussion of the problem of ignition the authors assumed that the igniting spark occurred in a perfectly homogeneous mixture of the right chemical composition. It is difficult to theorise about the special problem that arises at starting, because the conditions, so far as the mixture is concerned, are naturally very imperfect and very uncertain. That is, the mixture and cylinder walls are cold, and it is reasonable to imagine that the mixture, as it enters the cylinder, does so in the form of a mist in which there may be quite large globules of petrol floating about. It is possible that under these adverse conditions the actual heat liberated by the spark may be a factor of importance, in so far that it may vapourise any petrol globules in its immediate vicinity.

It is easy to calculate the number and magnitude of the particles of petrol which a magneto spark is capable of evaporating, and this has been done, assuming that a relatively feeble spark dissipates the whole of its energy (0·03 joule) in heating the particles from atmospheric temperature to, say, 100 C°. and vapourising them at normal pressure. We find that under these conditions the spark is able to vapourise ten globules of petrol, each of which is about ten thousandths of an inch in diameter.

It should not be understood from this that a plug gap short-circuited by petrol globules under engine turbulence and pressure conditions would necessarily function as an evaporating apparatus, but it is quite clear that even a feeble spark is capable of appreciably heating minute fuel particles which lie in its path. This is, perhaps, a novel standpoint from which to consider the ignition process, and the authors are inclined to view the possibility of the spark itself materially improving the local mixture conditions as being somewhat in the nature of a forlorn hope.

The inherent weakness of the petrol motor is that it is not a self-starter. An electric motor is started by the simple closing of a switch, whilst the steam engine is at once started by allowing the energy (in the form of steam) to enter the engine cylinder. Not so the petrol motor, and there does not seem any likelihood of this inherent weakness being eliminated unless some entirely new principle of operation is utilised. The automobile engineer can, however, devote his efforts to improving the efficiency of the auxiliary method of starting that must be adopted. This problem divides itself under two heads—

(*a*) The production of a more thoroughly homogeneous mixture of the right characteristics in the cylinder at the moment the spark occurs. This is purely a problem for the carburetter designer, and will not be touched upon here.

(*b*) The production of a reasonably energetic spark at as low a speed as possible.

Electric Starting Not the Final Solution.

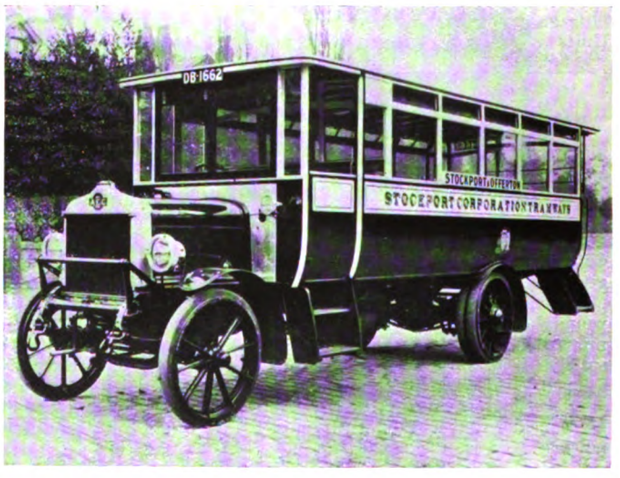
Recent improvements in magneto design have resulted in a considerable reduction in the minimum speed at which the magneto will produce regularly sparks of some given intensity. A four-cylinder magneto in which the authors are interested will, for example, spark regularly across a 5·5 mm. three-point gap at about 60 revolutions per minute with the timing lever fully advanced. This type of machine has been found to give good starting on a 3-ton lorry engine, which was always difficult to start with the much larger type of magneto (of older pattern) that it displaced.

This is good so far as it goes, but it is not enough. The mechanical exertion that is necessary to "swing" an engine, particularly when the horse-power is large, is of a very distressing nature, and something must be done to avoid it. It is now universal practice to adopt an electric motor for starting on pleasure cars, but when it is borne in mind that the primary function of the electric motor (and all the complications that its use entails) is to accelerate a magneto to a sufficiently high speed that it will regularly produce sparks at the plugs, it can reasonably be doubted whether this is the final solution of the problem. Further, the question of cost is a very important one on light cars, and will be of increasing importance in the near future with foreign competition.

The authors therefore believe that the use of what has been termed by our American friends an "impulse starter" opens up large possibilities in the attempt that is now being made to solve the starting problem. This device is designed to take the place of the ordinary coupling. It comprises, in essence, two members, one of which is rigidly secured to the magneto spindle and linked to the other, which is attached to the driving spindle by a stout helical spring. When the crankshaft is slowly rotated, the two members will move together until a pawl carried by the member on the magneto spindle is held by a stop fixed to the frame of the magneto. Any further motion of the member on the driving spindle causes the spring to be wound up, during which time the armature remains stationary. After a definite movement of this member the pawl is released, and the armature then suddenly flicks over, producing during its rapid motion an intense spark. This is sufficient to start the engine, which then rapidly accelerates. At a very low speed the pawl is thrown out of action by centrifugal force, and the two members rotate as a single unit.

It appears certain that for commercial vehicles and tractors, where the use of an electric starter is out of the question, some form of impulse starter will be successfully adopted in the near future. If this development occurs it is not unreasonable to suppose that an impulse starter may be applied to other forms of motor vehicle. As compared with an electric starting system, it is naturally much cheaper, and being a compact and simple mechanical unit, it obviously has—other things being equal—enormous advantages from the standpoint of reliability.

In thanking various gentlemen for aiding their investigations, the authors especially mentioned the British Thomson-Houston Company, with whom they are connected, for their extreme generosity in allowing the results of investigations carried out in the research laboratory forming part of their magneto organisation to be published. Without this assistance it would not have been possible to have prepared the paper.



Associated Equipment Company's Omnibus for Stockport Corporation Tramways.

New Edinburgh Corporation Omnibuses.—The Associated Equipment Company, of Walthamstow, London, E., have received an order from the Edinburgh Corporation through their Scottish agent for 36 saloon body single-deck omnibuses, fitted with electric lighting sets. The chassis of these vehicles will be of 45 H.P.

Admiralty Motor Vehicles.—The Admiralty have under their control 715 mechanical road transport vehicles. Of the total, 73 were in stock on February 26 to meet replacements, and the number in use (642) was subject to reduction as services of a temporary nature ceased.

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MOTOR TRAFFIC

MOTOR VEHICLES FOR MUNICIPALITIES.

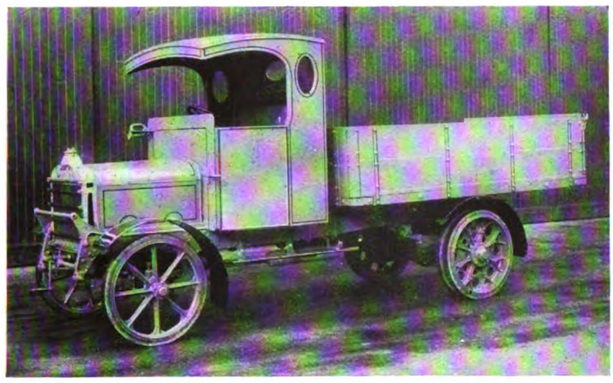
Ilkeston Corporation have sold a Foden steam wagon for £550.

Walsall Gas Committee have purchased a second-hand motor van.

Bingley Council propose to purchase a motor lorry at a cost of £950.

Poole Council are asking for power to borrow £1,590 for the purchase of a fire engine.

Metropolitan Asylums Board have purchased a second-hand Foden steam wagon for £1,030.



Daimler Lorry with Tipping Body.

Bethnal Green Council have ordered two disinfecting vans from Belsize Motors, Limited, at £1,400.

Salford Corporation have obtained permission to raise a loan of £2,200 for the purchase of a fire engine.

Birmingham Corporation propose to purchase a car for £750 for use on the Canwell Small Holdings Estate.

Liverpool Housing Committee have authorised the purchase of a motor wagon at a cost not exceeding £1,200.

Walthamstow Tramways Committee have asked the engineer to get prices for the supply of a motor tower wagon.

Newcastle-under-Lyme Council have received sanction to a loan of £1,445 for the purchase of a motor fire engine.

Bradford Streets Committee have purchased a Karrier tipping lorry for £795, and a Clement Talbot light lorry for £550.

Calcutta Municipal Council has decided to buy three Ford motor ambulances at an approximate cost of Rs.3,500 each.

Mansfield Woodhouse Urban Council are applying for permission to raise £1,380 for the purchase of an electric vehicle.

Southend Corporation have obtained the consent of the Ministry of Health to borrow £1,585 for the purchase of a motor fire engine.

Westminster City Council are establishing a workshop where all the municipal motor vehicles can be maintained and repaired.

Swansea Parks Committee are providing the parks superintendent with a second-hand motor cycle at a price not exceeding £40.

Walsall Corporation have had a letter from Essington Council expressing appreciation of the omnibus service through Essington.

Leyton Urban Council are having speedometers fixed to the motor fire engines. The cost is £14 14s. each, plus a guinea each for fixing.

Wolverhampton Corporation, owing to the high cost of horses, have decided to give a trial to an electric vehicle, when comparisons will be made.

Salford Council are recommended by the Health Committee to accept a tender for the supply of a new Crossley motor chassis for the ambulance.

York Fire Brigade Committee suggest the purchase of an additional fire engine, recommending one from Dennis Brothers, Limited, Guildford.

Hackney Council have obtained sanction to borrow £5,418 for the purchase of two 2-ton and two 3½-ton electric vehicles for the collection of house refuse.

Sheffield Corporation Tramways Committee have sold one Daimler C.B. type chassis, 28 h.p., for £350, and two similar chassis to the city surveyor for £350 each.

Boston Rural Council are spending £3,750 for the purchase of steam tractors and wagons. It is estimated that mechanical traction will effect a saving of £1,000 a year.

Manchester Markets Committee are purchasing three Ford cars for the use of its inspectors. The Health Committee are obtaining, at a cost of £3,600, two ambulances and one van.

Essex County Council having failed to purchase a satisfactory car for £500 for the use of the engineering assistant, have decided to obtain a 16-20-h.p. Straker-Squire chassis for £350 and a second-hand body for £100.

The Disposal Board states that they have a limited number of unused 25-h.p. Crossley ambulances at £600 each, and Walthamstow Urban Council have asked a sub-committee to report as to the purchase of one of the vehicles.

Dudley Corporation suggests allowing the surveyor £200 a year towards the cost of a car, as this arrangement will dispense with the horse and trap now provided, and enable the driver to be transferred to other work.

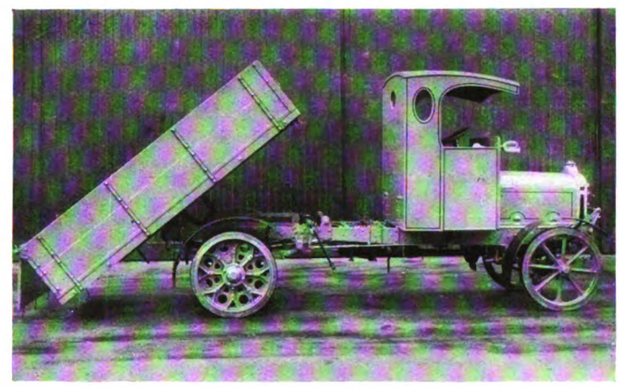
Leeds Corporation have accepted the following tenders—Electromobile (Leeds), Limited, an electric tipping wagon, £1,610; Yorkshire Commercial Motor Company, a steam cable wagon, £1,180; and to purchase a steam tipping wagon at £1,345.

Sanction has been given to Swansea Corporation to borrow £14,000 for the purchase of 16 wagons and trailers; to Ilford Council for £8,050 for motor vehicles; to Redditch Council for £1,350 for a motor wagon; to Middlesbrough Town Council for motor fire engine, £1,089.

Bolton Corporation have purchased a 30-cwt. Vulcan chassis fitted with tipping body, and a Straker-Squire lorry from the Government. The Fire Brigade Committee have appointed a sub-committee to inspect the equipment of the Manchester Brigade with a view to increasing their motor appliances.

Marylebone Borough Council have accepted the offer of Messrs. Leyland, Tatnell and Company, Limited, to supply seven tipping bodies made by Messrs. Chalmers and Son, of Redhill, fitted with patent sanitary covers, at £120 each, and a "Craymer" unloader fitted to the seven tipping bodies for the sum of £85 each, including fittings. These are required for the seven Austin chassis just purchased.

Poplar Works Committee report that the cost of providing a vacuum gulley emptier with a 55-h.p. 5-ton motor, having an 850-gallon circular tank, suction tubes, and appliances, would be £1,275. The present cost of emptying gullies is £2,186 per annum, or 9s. 7d. per gulley. The estimated cost of emptying by means



Tipping Body of Daimler in Action.

of the vacuum gulley emptier, including depreciation of the machine, is £1,499 per annum, or 4s. 9d. per gulley. The committee suggest that a gulley emptier be obtained on trial, and, if satisfactory, purchased.

North Riding County Council, on the advice of the county surveyor, in order to enable road materials to be handled with the minimum of cost and the maximum of efficiency, have agreed to purchase five petrol lorries (10 ton), £800 each; twelve lorries (5 ton), steam type, with rubber tires and tipping bodies, £1,300 each; four Mann's steam wagons at £1,200 each; four Ford light lorries, £300 each; and two motor cycles with side cars, £130 each. Four 5-ton steam wagons have been ordered from Messrs. Clayton and Shuttleworth, Limited.

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MOTOR TRAFFIC NOTES.

Motor Vehicle for Rail Welding.—Bolton Tramways Committee have asked the manager to get prices for rail welding plant and a motor chassis.

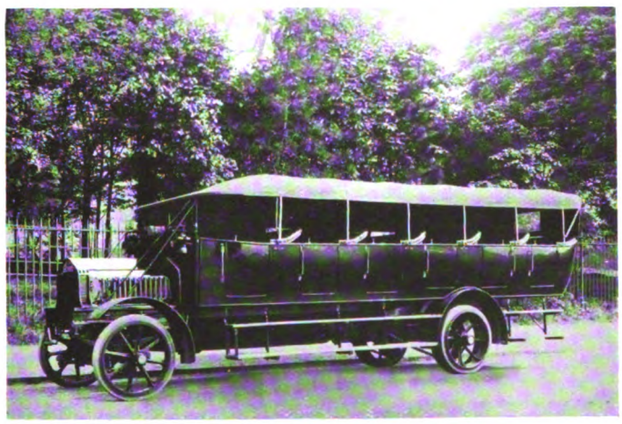
Paris Omnibus Company.—The Paris Municipal Council propose to purchase the undertaking of the Paris Omnibus Company by paying an annuity of 15,000,000 francs for thirty years.

Compulsory Splashguards.—Deptford Borough Council have made representations to the Commissioner of Police suggesting that all motor vehicles which are subject to his licence should be fitted with a contrivance to prevent mud splashing.

London General Omnibus Company have applied to the London County Council for a licence to store about 21,000 gallons of petrol sunk in tanks at premises in High Street, Putney, lately occupied by the National Steam Car Company, Limited.

Bournemouth and Coach Licences.—Bournemouth Licensing Committee, having had an application from Trade Cars, Limited, Southampton, for four licences for chars-a-bancs, have refused because they are not prepared to increase the number of licences already granted.

Information of Wrecked Lamps.—Westminster Council have decided to pay a reward of 5s. to any person, other than an employee of the Council, giving information of identity of any person causing damage, by collision of vehicles or otherwise, to lamps, lamp-posts, guard-posts, or other street works.



Albion Coach Run by Messrs. Matthews, Glamorganshire.

Corporation and a Commercial Motor Service.—The Tramways Committee of Walsall Corporation have agreed to an arrangement being entered into with Messrs. the Tramways and Motor Express to work in conjunction with them a commercial motor service, subject to certain terms and conditions.

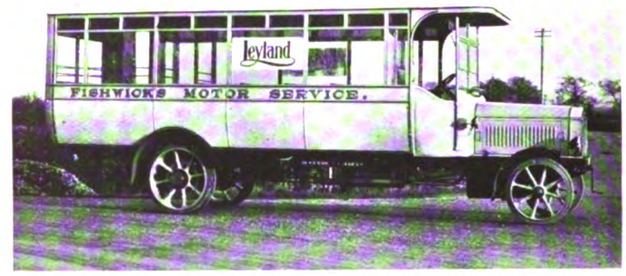
Indoor Loading.—Modern buildings are erected on plans that provide either for a central or side courtyard, in which motor vehicles can be loaded, thus avoiding the inconvenience and obstruction resulting from performing that task in the public street. An additional aid to economical working is being adopted in New York, viz., the provision of a lift for taking the vehicles to floors above or below the street level.

Effect of Sulphur in Benzol.—Reporting to the Petroleum Executive on the results of his investigations as to the effect of sulphur in benzol on various metals, Sir J. Cadman states that specially procured benzol with an excessive sulphur content was used, but the experiments afforded no evidence that the sulphur has any corrosive effect on carburetters. The specification of the National Benzol Association fixes 0·4 per cent. of sulphur as the maximum.

Fish from Sea to Door by Motor.—On March 2 a scheme was inaugurated in Manchester by which fish is brought from the ports to the suburbs of the city in motor "fish shops," from which sales are made to the householders. While the innovation seems to have brought down prices, the proprietors of fish shops contend that the competing agency cannot possibly sell at such low prices as the former, who can purchase their stocks anywhere, while the new agency is limited to its own markets.

Reconstruction Work in France.—The Commercial Motor Users' Association have made arrangements with the Department of Overseas Trade whereby motor haulage contractors who desire to send their lorries to the Continent for work in connection with reconstruction may do so without having to deposit cash in respect of the 70 per cent. *ad valorem* customs duty. The French Director of Customs has agreed to accept a written guarantee from the association in respect of such deposit.

Omnibus Sideguard Law Case.—At Sheffield Tramways and Motor Committee the general manager reported that he had received



A Single-Deck Leyland Omnibus.

notice from solicitors that the sideguard in use on the omnibuses infringed their client's 1912 patent. An appeal was pending in the House of Lords between the patentees and the London General Omnibus Company with regard to the use of this type of guard. The company stated that several omnibus users had been threatened with actions, and had expressed a willingness to contribute towards the cost of the appeal. The committee decided to bear a portion of the cost.

The King Inspects a Veteran Omnibus.—Thirty-five of the London General Omnibus Company's drivers, who had all seen service in the war, were inspected recently by the King at Buckingham Palace. They were conveyed to the Palace in omnibus B 43, the first to go to France for war purposes, and one of the last to come home. The King inspected the men, shaking hands and speaking with each of them, and he then turned his attention to the veteran omnibus. Lord Ashfield, chairman of the company, pointed out the brass plate on the omnibus, which bears the following statement—

1914 ...	...	Antwerp.	1917 ...	...	Somme.
1915 ...	...	Ypres.	1918 ...	...	Amiens.
1916 ...	...	Ancre.	1919 ...	...	Home.

"Lest we forget."

Boarding the omnibus, His Majesty glanced at the interior, and was then driven round the courtyard. He remarked that it was

Electric Lorry by the General Vehicle Co. Ltd.

the first occasion he had travelled in a motor omnibus, although he had been in a tramway car. He referred, no doubt, to the occasion when, as Prince of Wales, he opened the first electric tramway of the London County Council in May, 1903, travelling from Westminster Bridge to Tooting.

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THE Tramway & Railway World
WITH MOTOR TRAFFIC SECTION

Founded 1892. LONDON, APRIL 15, 1920. VOL. XLVII.

NEW ROLLING STOCK FOR BAKERLOO AND WATFORD SERVICE.

JOINT STOCK BUILT FOR LONDON AND NORTH-WESTERN AND LONDON ELECTRIC RAILWAY COMPANIES.

The first of a series of ten new six-car tube trains recently made its appearance on the Bakerloo and Watford service. These trains are being specially built for the through service between the southern terminus of the Baker Street and Waterloo Railway at the Elephant and Castle Station in South London and Watford, a distance of 21 miles. Since the London and North-Western Company's electric lines from Willesden to Watford were completed, and the extension of the "Bakerloo" Railway to Queen's Park, it was intended that they should be ready as soon as the Watford extension was completed. Owing to the war and to labour troubles following on it, delivery of the trains has only just begun; but is expected that all the trains will be in service within a few weeks.

As each new train is added, the ordinary Bakerloo cars which it replaces will be taken out of service on the Watford extension, and will be used to strengthen the service between the Elephant and Queen's Park, Willesden, where the Bakerloo joins the London and

New Train for Bakerloo-Watford Service on a Siding at West Kensington.

Willesden, was carried out, through trains belonging to the London Electric Railway Company have been run to and from Watford, but the traffic and immediate developments in sight demanded more rolling stock. It was decided to have a superior class of car for the journey, which is very long compared with those of London tube railway services; and the London and North-Western and the London Electric Railway Companies determined to own trains for the service which would compare favourably with anything hitherto built capable of passing through the London tubes. The order was given as far back as 1914 to the Metropolitan Carriage, Wagon, and Finance Company, Birmingham, for ten trains of six cars each, and North-Western. Between these points the Bakerloo is running five-car trains at present, and as the new trains come into service on the route to Watford the old cars will be used to build up a complete set of six-car trains on the Bakerloo line. The latter, serving so many main line termini, and carrying a very heavy traffic in the mornings and evenings, has been a severe sufferer from war and post-war difficulties. The provision of an additional 20 per cent. of passenger accommodation on the ordinary service will be a material advantage to the public, not to mention the harassed officials of the London Electric Railway Company.

The new joint stock is imposing in appearance when the limitations as to height imposed by tube tunnels

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are considered. The cars are of all-steel construction, with a minimum of wood in internal fittings. They are painted externally in standard London and North-Western Railway colours, chocolate-brown below and white panels above. Internally the colour scheme is a dark cream for the side steel panels, while the ceiling

Each train is made up of three motor cars and three trailers, a novel departure as regards tube railway trains. Hitherto these have only had two motor cars, one at each end, but the new trains follow the example of the Metropolitan District Railway by having a motor car in the middle. This necessitated some

Interior of New "Tube" Car.

of the arch roof is of asbestos millboard enamelled flat white. Nothing more suggestive of light and air could be devised.

The total weight of the six-car train unloaded is 161 tons. This is some two tons per car heavier than the existing steel rolling stock of the Bakerloo. The object of using heavier steel plate for the bodies is to diminish vibration and noise in the tube tunnels.

modifications in equipment detail to satisfy the safety requirements of the Ministry of Transport, which are, of course, more stringent in the case of a tube railway than in that of a shallow underground line with big tunnels like the District Railway.

The seating capacity per train is 252, each motor car having 36 seats and each trailer car 48 seats. As in the earlier tube-rolling stock, there is a

Side View of New Car showing arrangement of Doors.

The following are the leading dimensions of the cars—

Length overall	50 ft. 10 in.
Width over body	8 ft. 8 in.
Total height from rail	9 ft. 5¼ in.
Centres of bogies	34 ft. 0 in.
Diameter of motor wheels	42 in.
Wheel base of motor bogie...	7 ft. 0 in.
Diameter of trailing wheels	32 in.
Wheel base of trailer bogie	6 ft. 0 in.

combination of cross and longitudinal seats. All are large and comfortable, and the upholstering is done in red and black rep.

The lighting arrangements, both for day and night, are excellent. In a train which runs only in a tunnel the question of windows is of small importance except for the purpose of enabling passengers to see the names

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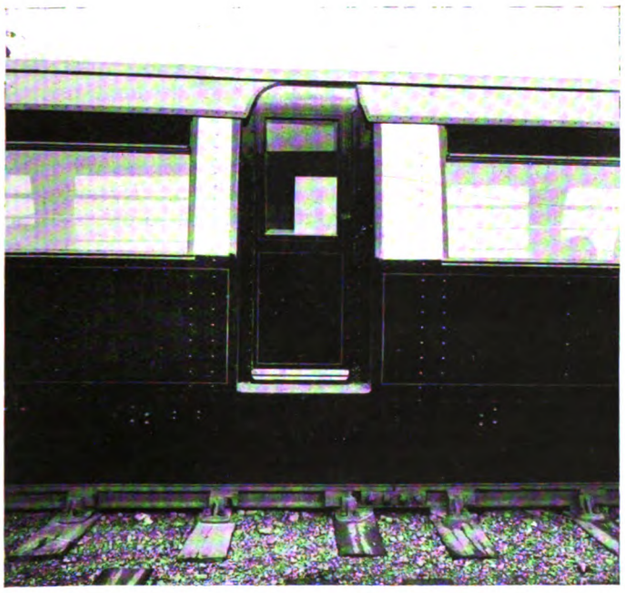
of stations. But in this case half or more of the total journey is done in the open air. The windows are large, and have hinged ventilators at the top which can drop to an angle of about 30 deg. In addition an air duct with perforations runs the whole length of each car.

For lighting at night and when in the tunnels each motor car has six opal bowl roof lamps and six auxiliary small lamps along the sides. Each trailer car has nine opal roof lamps and eight side lamps. The general effect is pleasing and satisfactory, and coupled with the light-coloured internal decoration a brilliant but diffused illumination is the result. Emergency lighting is obtained from accumulators which are automatically switched on when required. A novelty in the internal fittings is the provision of small hat-racks under the arch of the roof.

As in some other recently designed cars, strap-hanging has been abolished. There are no overhead rails with depending straps. Instead of these a handle is placed at the top of the back of each cross seat, and near each end of the car are vertical rods which the passenger may grip. Further, the centre doors are flanked by short partitions supplied with vertical holding-on bars.

This brings one to the subject of doors—an important and difficult matter in tube railway cars if anything more than end doors are provided. The new rolling stock has end doors with fully vestibuled platforms, but unlike tube railway trains in general there are also centre doors. The scheme in regard to these is a development of that of the existing Bakerloo and Watford cars. In the case of the District Railway there is no difficulty in providing sliding central doors, but owing to the necessary top taper-in of the section of a tube car sliding doors are impracticable. Doors opening outwards are also prohibited by the conditions. Centre doors opening inward are accordingly provided, and in whatever part of a car a passenger is he is within a very few feet of a door.

The end doors are worked in the usual way by a gateman, and open inwards. The centre doors are locked shut electrically except when the end doors are open. The locking and unlocking of the centre doors is under control of the gateman, these doors being closed by a standard design of spring, mounted under the car floor. Embodied in the pedestal which holds



The Centre Door Opening Inward.

the mechanism for operating the end doors is a switch which controls the circuits governing the electric lock of the middle door. When the gateman opens the end door he automatically unlocks the middle door, and this fact is made plain by a red lamp becoming illuminated in the pedestal supporting the end door mechanism. When the end door is again shut it closes the circuits which lock the middle door, and a green lamp in the pedestal becomes illuminated. Should, for any reason, the end car door be shut and

A Motor Car.

locked, and the centre door has not properly fastened, the red lamp in the pedestal will continue to burn until the door has become properly locked.

In connection with through running between a tube railway, with its limited head-room, and one of the trunk lines of the country, a special requirement has to be met. The tube railway station platforms are much lower than the standard of London and North-Western stations, which are suited for their big rolling stock. In the case of the cars which have hitherto run from London to Watford the difficulty was met to a certain extent by the provision of a ramp on the end platforms of the cars. In the new rolling stock this has been abandoned, and the sweeping course has been taken of making the floor of the cars five inches higher than that of the old cars. Yet head-room inside appears quite ample. The new floor level is a compromise between the Bakerloo and the North-Western platforms. From one of the former the passenger has to take a small step up on entering the car, while from one of the latter he has to take a small step down. Incidentally, the raising of the level of the car floor has enabled 42-inch driving wheels and 32-inch trailing wheels to be fitted, instead of the 36-inch and 30-inch wheels employed on existing stock.

The Electrical Equipment.

Each motor car is fitted with two British Thomson-Houston motors of 240 H.P. each, geared for running at 40 to 45 miles an hour. This gives well on for 1,500 H.P. per train, and will permit both of rapid acceleration and of high speed on the country section where stations are farther apart than they are in London. A departure has been made from the pressed steel trucks hitherto employed on the "Underground," the trucks being built up of steel plates and angles.

The British Thomson-Houston system of multiple-unit control employed is similar to that on the rolling stock which is now running to Watford, and which was lent by the Central London Railway Company. That, however, is the only example of the particular method, and it may be described in some detail. The Central London Railway cars now running to Watford were built for the extension of the Central London line from Shepherd's Bush to Ealing. The extension,

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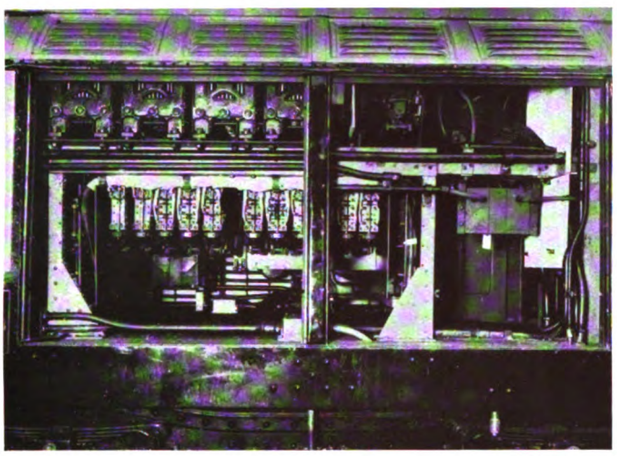
which will make a junction at Ealing with the Great Western Railway main line, was delayed owing to the war, so far as the electrical equipment at least was concerned, but electrical working is expected to begin soon, and the lent Central London cars will be put on.

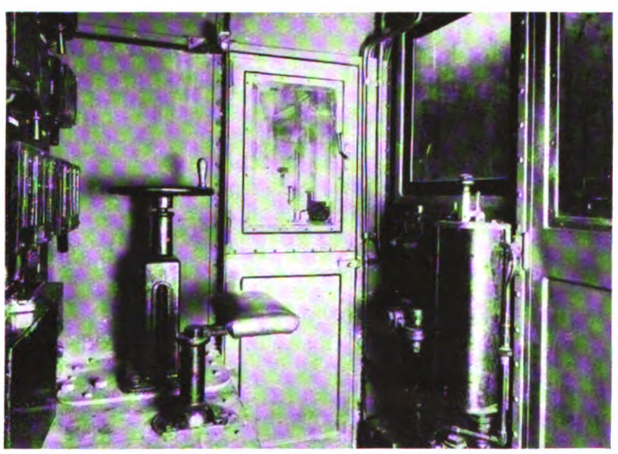
The control equipment as supplied to the new Watford joint stock is of the relay automatic type. The normal method of operation with this system is to place the controller at once in the full parallel position



Back of the Contactors.

when starting a train. The contactors are then picked up in their correct sequence by the current limit relay, which operates as soon as the motor current has dropped to a pre-determined value.

The relay consists of two shunt and one main coils. The latter carries current equal to that of one motor only. The actuating coils of the contactors are energised through one or other of the two shunt coils in such a manner that, if one is energised through one shunt coil the next one to close will be energised in series with the other shunt coil. The two relay shunt coils act on two plungers controlled by gravity. Each



Interior View of Motorman's Cab.

plunger, when in its lower position, closes a disc switch in series with the other shunt coil; but when raised (due to its coil being energised) opens this switch. Thus, when one of the plungers is raised the shunt coil, acting on the other, cannot be energised because of the break on the circuit produced by the above-mentioned switch, but although it is the control current that raises the plunger, so as to produce this break, it is the current passing through the main coil which maintains the break, and the plunger is not released until this current has dropped to the pre-determined value. Then the plunger falls and closes the switch, which completes the circuit for the next contactor coil to be energised.

The principle underlying the method of control adopted in connection with the current limit relay is that after a contactor has been picked up, as described above, its coil is immediately transferred (by means of interlocks) to another wire. There are thus essentially two operating wires, the picking up wire and the retaining wire (although other wires are introduced for forward and reverse, circuit breaker setting, etc.).

As there are no main bus lines down the train a potential relay is fitted on each motor car, which drops all contactors on that car when the shoes lose current. This is necessary, because when no current passes through the main coil of the current limit relay, it ceases to exercise its control over the rate of picking up of contactors. The controller has four forward points and two reverse (series only), of which numbers 2 and 4 are running points, where all resistance is cut out.

A useful provision in the control is that if in the course of the automatic notching up the controller

Door Actuating Mechanism.

handle is brought back to the first or third notch, as the case may be, the automatic closing of contactors is stopped, but those already closed are kept up.

The working of the safety button on the controller handle differs from the London Electric Railway standard in that the safety button can be released, except when the handle is at off position. If, however, the handle itself be let go, it flies back to off position when current is instantly cut off, and the brakes applied throughout the train.

Another safety device, which is now part of the standard London Electric Railway equipment, is the control circuit governor. By interrupting the control circuits it prevents the train being driven forwards unless the train pipe of the Westinghouse brake is charged with air and the tripcock is cut in.

The brake equipment is Westinghouse, with quick-acting triple valves. The brake blocks are of unchilled cast-iron. The brake rigging on the trucks is of the clasp type, this being the first rolling stock on the Underground fitted with double blocks. The air compressor is of the B.T.H. C.P. 30a type.

Experimental runs with the first of the new trains which took place in March were highly satisfactory.

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AN ECONOMIC FARE.

By an Engineer.

Amongst the major problems of post-war reconstruction few are of more widespread interest and importance than housing. Not merely was the normal rate of building brought to a standstill during the war by the concentration of effort on military activities, but the national conception of suitable standards of living has undergone a profound transformation, and the demand is as insistent for new and better houses to replace the old as it is for making good the leeway lost during four years of warfare. Add thereto that the cost of building has increased from 100 to 150 per cent. over pre-war prices, and the reason is at once apparent that housing has perforce become a State-aided municipal enterprise.

Once established on that basis, the housing problem reduces to the problem of the economic rent. How can houses be built in such a manner and in such surroundings as to conform with the new standards of comfort and well-being and yet be letable at a rent which will make a moderate return on the capital outlay?

The first cost of a housing project is made up of several factors besides the actual cost of buildings. Land, roads, drainage, water, gas, and electric services all contribute their quota, and each of them is affected by the position of the site selected for building operations. The further the site from the centre of the town the greater is likely to be the cost of drainage, water, and similar services, but the cheaper will be the land, and, for a given outlay on land, the greater will be the area of gardens and open space that economy can concede to health and comfort.

Concentration is both necessary and unobjectionable for business houses, shops, and similar buildings, but for dwelling-houses it is undesirable, and is made necessary only by lack of adequate transport. Density of population is not an indication that those affected prefer to live in crowded and unhealthful conditions, but a proof that the means are wanting for transporting them between the area of their daily activities and more spacious and hygienic homes. Provided, then, that the cost of water supply and similar services does not impose an insuperable barrier, housing schemes should be projected beyond the existing limits of close settlement, but within easy access of the centres of population.

From the foregoing considerations it appears that the problem of the economic rent is closely bound up with the problem of the economic fare. By what means of transport can the desired facilities be provided at the lowest fare consistent with an economic return on capital outlay? Each particular case is necessarily affected by a variety of local circumstances—such as existing means of transport, the radius of the closely settled area, the extent of the proposed housing site, and its distance from the centre of the town. The economic fare applicable to any particular project can only be derived from full knowledge of all the conditions, but an investigation of one typical case will disclose the various factors which have to be taken into consideration, and will indicate the method of transport which will in general most satisfactorily comply with the requirement of low fares combined with an economic return on capital outlay.

There are few towns of 50,000 to 100,000 inhabitants in which the inhabited area is not encompassed within a radius of less than two miles. There may be in some cases outlying spurs projecting to a greater distance, but land beyond the two-mile radius is as a rule mainly agricultural land, undeveloped by the builder and purchasable at agricultural value. Between the two-mile radius and the three-mile radius is an area of over 2,500 acres, within which there should be no difficulty in selecting a site of a few hundred acres for housing purposes. By way of illustration, let it be assumed that the project involves 600 houses and that the site, which would probably run to about 100 acres, is three miles from the centre of the town. Three alternative methods of transport will be considered—tramways, motor omnibuses, and trolley omnibuses.

It is first of all necessary to determine the number of vehicles that will be required to cope with the maximum density of traffic. For this purpose it may be assumed that a house contains on an average five persons, and that of the total population of 3,000 persons 750 are workers, all of whom require transportation in the same direction within a period of 45 minutes. It is also assumed that the average speed, including stops and terminals, is eight miles per hour, so that the time for a car to complete the double journey of three miles in and three miles out will also be 45 minutes. Tramcars suitable for this service would have a maximum carrying capacity of about 80 passengers. Nine tramcars would therefore be required for the service, or say 10 in all, including one spare. The capacity of motor omnibuses is limited to between 40 and 50 passengers, and 15 motor omnibuses would therefore be required for service with at least one in reserve, making 16 in all. Trolley omnibuses are better able than motor omnibuses to deal with overloads, and can also be designed for a greater normal capacity without causing correspondingly increased stresses on the roads. These advantages may be ignored for the present, and the number of trolley omnibuses may be fixed at 16 also. The tramcars would cost about £2,000 apiece, and the motor omnibuses about £1,750. Trolley omnibuses will eventually be cheaper than motor omnibuses, but not having yet reached the stage of mass production, are now somewhat more expensive. They may be estimated at £2,000 each.

Both tramcars and trolley omnibuses require overhead wires and feeders, and the equipment for the latter will be rather more expensive than for the former on account of the necessity of installing both negative and positive trolley wires. An ample allowance would be £10,000 for the tramway and £12,000 for trolley omnibuses. In each case it is assumed that power is purchased from some existing source of supply and delivered to the trolley wires and feeders at an inclusive price. It might alternatively be assumed that power is purchased in some form from which it would have to be converted in order to become utilisable. Or again, it might be necessary to instal a power-station and to generate electric power instead of purchasing it. In either case the extra capital cost would be compensated by the saving in annual cost, and the economic result would not be materially affected.

The tramway will also require three miles of double track, the cost of which may be estimated at about £75,000.

All three alternatives entail the construction and equipment of car sheds and repair shops. Sums of £6,000 for buildings and £2,000 for equipment would adequately cover the needs of the tramway. The motor omnibus garage would also cost about £6,000 and the equipment about £4,000. For trolley omnibuses buildings would absorb £6,000 and equipment £3,000.

The total capital outlay on each of the three alternative methods of transport is summarised in Table 1, in which are also shown the respective annual standing charges for interest and depreciation. Interest is

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therein reckoned at 6 per cent. per annum, and the rates of depreciation are based on the expectation of useful life appropriate to each item.

TABLE I.

Capital Outlay.		Standing Charges.		
Item.	£	Interest and Depreciation.	Rate per cent	Per annum. £
TRAMWAY—				
Rolling Stock ...	20,000	Depreciation	4½	900
Trolley wires and feeders	10,000	,,	3	300
Permanent way ...	75,000	,,	4½	3,375
Car Shed—				
Buildings equipment	6,000	,,	1½	90
Equipment	2,000	,,	8	160
Total	113,000	Interest ...	6	6,780
			Total	11,605
MOTOR OMNIBUSES—				
Rolling stock	28,000	Depreciation	15	4,200
Car Shed—				
Buildings	6,000	,,	1½	90
Equipment	4,000	,,	8	320
Total	38,000	Interest ...	6	2,280
			Total	6,890
TROLLEY OMNIBUSES—				
Rolling stock	32,000	Depreciation	8	2,560
Trolley wires and feeders	12,000	,,	3	360
Car Shed—				
Buildings	6,000	,,	1½	90
Equipment	3,000	,,	8	240
Total	53,000	Interest ...	6	3,180
			Total	6,430

The next step is to determine the probable total volume of traffic in one year. It has already been estimated that the maximum density of traffic will require a three-minute motor omnibus or trolley omnibus service (or a five-minute tramcar service), and it may be assumed that this frequency of service will be maintained for a total period of two hours during every weekday except Saturdays. A five-minute service would probably be required during another two hours daily, and the remaining requirements would be satisfied by a 15-minute service for 12 hours. These assumptions are equivalent to a 16-hour working day and a daily total of 672 car-miles. On Saturdays a more frequent service would be needed, say 780 car-miles, and an average 12-minute service, or 480 car-miles, would probably suffice on Sundays. The weekly motor omnibus or trolley omnibus traffic will then be—

	Car miles.
5 days at 672 car-miles per day	= 3,360
1 day at 780 ,, ,,	= 780
1 day at 480 ,, ,,	= 480
7 days	4,620

or 240,000 car-miles per annum for the rubber-tired vehicles, and 210,000 car-miles per annum for the tramways.

In formulating an estimate of the working costs of operating the proposed service, it is assumed that the combined wages of a driver and conductor are 3s. 6d. an hour, that petrol costs about 3s. per gallon, and that electric power is purchased at 2d. per B.O.T. unit delivered at the trolley wires. The actual cost of electric power, as now sold to tramways, varies from a maximum of about 2½d. per B.O.T. unit down to 1d., and occasionally less, with 1½d. as a fair average. The cost of management, supervision, and other general expenses for an undertaking of this size would probably be between £1,500 and £2,000 a year, and may be taken at £2,000.

The working costs of each method of transport per car-mile and per annum are shown in Table II.

TABLE II.

Working Costs.	Pence per Car-mile.	£ per annum.
TRAMWAY (210,000 car-miles per annum)		
Wages	5·0	4,375
Power	2·0	1,750
Maintenance—		
Rolling stock	1·5	2,012
Permanent way	·5	
Trolley line	·3	
Management and general	2·3	2,000
Total	11·6	10,137
MOTOR OMNIBUS (240,000 car-miles per ann.)		
Wages	5·0	5,000
Fuel and lubricating oil	5·5	5,500
Tires	1·0	1,000
Maintenance...	3·5	3,500
Management and general	2·0	2,000
Total	17·0	17,000
TROLLEY OMNIBUS (240,000 car-miles per ann.)		
Wages	5·0	5,000
Power	2·0	2,000
Tires	1·0	1,000
Maintenance—		
Rolling stock	1·7	1,700
Trolley line	·3	300
Management and general	2·0	2,000
Total	12·0	12,000

The economic revenue, or minimum annual return which will cover working costs and standing charges, is shown in Table III.

TABLE III.

	Pence per Car-mile.	£ per annum.
TRAMWAY—		
Working costs	11·6	10,137
Standing charges	13·3	11,605
Economic revenue ...	24·9	21,742
MOTOR OMNIBUS—		
Working costs	17·0	17,000
Standing charges	6·9	6,890
Economic revenue ...	23·9	23,890
TROLLEY OMNIBUS—		
Working costs	12·0	12,000
Standing charges	6·4	6,430
Economic revenue ...	18·4	18,430

In order to derive from Table III. the economic fare for each method of transport, it is necessary to estimate the number of passenger-miles per annum. It has already been assumed that 750 workers will make the double journey of six miles once every weekday, or, say, 300 days in the year. Workers will then account for 450,000 single journeys, or 1,350,000 passenger-miles per annum. In addition to the regular morning and evening traffic of workers, the population of 3,000 may also be expected to make the double journey on an average of 100 times a year each. This traffic will

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account for 600,000 single journeys or 1,800,000 passenger-miles per annum. The service will also be utilised by others besides the actual inhabitants of the housing colony, and it may be assumed that the traffic from this source will be 150,000 single journeys, or 450,000 passenger-miles, in the year. Thus the total annual traffic would be—

	Number of Passengers making Single Journey per annum.	Passenger Miles per annum.
Workers	450,000	1,350,000
Ordinary fares	600,000	1,800,000
Ordinary fares from outside	150,000	450,000
Total	1,200,000	3,600,000

The economic fare for each system of transport is equal to the economic revenue divided by the number of passenger-miles—

	Economic Revenue. £ per annum.	Economic Fare. Pence per Passenger Mile.
Tramway	21,742	1·45
Motor Omnibuses	23,890	1·59
Trolley Omnibuses	18,430	1·23

If it is assumed that workers' fares are fixed at one penny per mile, the respective economic fares for ordinary traffic would be—

	Economic Revenue from Ordinary Fares. £ per annum.	Economic Fare for Ordinary Traffic. Pence per Passenger Mile.
Tramway	16,111	1·72
Motor Omnibuses	18,265	1·95
Trolley Omnibuses	12,805	1·37

It is apparent that, in the particular case selected, the economic fare on a tramway is 25 per cent. higher than by trolley omnibus, and that motor omnibus fares would have to be more than 40 per cent. higher than trolley omnibus fares. The assumed conditions might be varied over a wide range, such as by increasing or decreasing the length of the route and the size of the housing colony, without materially affecting the relative economic results. On a shorter route, and with a larger population the economic fare would be lower in each case, but the trolley omnibus would still show a lower economic fare than either of the other methods. Only if conditions were such that traffic is too heavy for any but very large cars would a tramway become necessary, and only if the traffic were very light and infrequent would motor omnibuses be economically justifiable.

It seems almost too good to be true, but the fact is that, after years of enforced spendlessness, American electric railways are buying. During the first two months of this year more than a third as many cars were ordered as during the entire twelve months of 1919, and deliveries are rapidly improving. It is true that the purchases now being made by electric railways are either to cut down cost of operation or to make necessary repairs. The interesting fact, however, is that the roads are going ahead in these necessary expenditures. The market is awakening, and, like a snowball, continues to gain in volume as it passes along.—*Electric Railway Journal* (New York).

THE WORK OF THE TRANSPORT MINISTRY.

In the House of Commons on March 24 a discussion took place on the work of the Ministry of Transport, the opportunity being the debate on the second reading of the Consolidated Fund (No. 1) Bill. Sir Eric Geddes replied to the criticism on various points of detail, and thereafter made an interesting statement dealing generally with the operations of his department.

He reminded the House that the Ministry of Transport came into existence only between five and six months ago. Future problems called for a great deal of technical investigation. His own proposals had reached the stage of having been submitted to the Cabinet, and they dealt with the transport of the country as a whole. Those proposals had been referred back to him to reconsider certain points and these he had now answered. He did not intend at present to say what the proposals were. At the same time the Ministry were investigating, with the help of the railway companies' technical officers, such things as the loading gauge, the re-grouping of services, the electrification of railways, and the directions in which future economy in the working of railways could be attained. The object was so to organise the railways as to work for the creation of traffic and not the piracy of traffic by one from the other. In regard to economy in his department, he pointed out that Sir Hardman Lever, a Treasury officer of great ability, was living in the department, and was entirely independent of the Ministry. That arrangement had been made at his (Sir Eric Geddes') request.

The Railway Position.

Describing what the railways were doing, he pointed out that before the war the country relied for transportation largely on coast-wise shipping. That trade had not yet been picked up again, and the railways were doing their best to undertake it. They were bringing coal from Northumberland, Durham, and Wales to London in quantities never dreamed of before the war. Then there had been five years' depletion of plant, rails, rolling stock, locomotives, officers and men. The sheds and warehouses were choked with stores. Then an eight hours' day was suddenly imposed on the railways and docks and industry generally. There was a total disorganisation of trade, which was flowing in ways in which it had never flown before and going distances which it never went before.

In reference to the Government guarantee to the railway companies, it meant that in seven or eight years, in a time of undreamt-of dislocation, there was no direct incentive to economy on the part of those operating the lines. It was only when there was a direct incentive, whether in profits or advantages, that they could get good management. But there had been nothing left but devotion to duty. The railway management and staff had discharged their duties with great patriotism and zeal; but there was no incentive either to advantage or profit. The incomings of the railways amounted to about £250,000,000, and the outgoings to £200,000,000. The Government decided that there must be a proper system of check on this vast expenditure. The State had to make good arrears of maintenance. His department had to carry out the technical examination of every large scheme. They had accountants keeping a check, and he affirmed that 90 per cent. of the cost of the Ministry of Transport was justifiable on that working alone. There was also an estimated deficiency for the current year of

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£45,000,000, and on that a great deal had to be done in the way of investigation.

TRAMWAY FINANCE.

Another class of activity which he Ministry had to undertake was in connection with tramway finance. Although the Government control was blamed for the present financial position of the railways, there were other, and uncontrolled, transport undertakings which were in a similar state financially. There was practically no tramway system in the country, municipal or company owned, that had not to come to Parliament for power to make increased charges. They could not meet the reasonable increase of wages to their men, which the Industrial Councils had agreed were reasonable, until their statutory powers were increased. If that increase had to be obtained by Private Bill legislation, without the most careful technical and accounting investigation, it would be an interminable process. The Private Bill Committees could never arrive at as accurate a decision in a reasonable time as they could if assisted by thorough technical and accounting investigation. He would take, for example, the Bill which was being promoted by the Underground Electric Railway Combine. Two accountants have worked for six or seven weeks at a report on that for the London Traffic Committee, a financial report which would be of infinite value to the Committee which would consider the Bill. It was largely on such work that the Ministry staff were employed.

WAGONS.

He had taken out some figures showing what the sixteen railways, which form 95 per cent. of the total, were doing. Taking first the case of wagons, on June 30, 1919, there were 650,000 wagons belonging to the railways in this country, a deficiency on December, 1913, of 45,000. In September, 1919, that deficiency had come down to 43,400. In December, 1919, the deficiency was down to 19,000, and it was still going down fast. That arose partly from new construction, although new construction had not yet reached anything like the full flood. The normal replacement and augmentation before the war was about 25,000 wagons a year. On June 30, 1919, orders had been placed on the companies' own shops and with private builders for 21,000. On December 31 that had increased to 32,800, and now it was 40,125. The orders would go on increasing, and for the last three months the average production of wagons had been 1,668. As to repairs, on September 30, 1919, 42,000 wagons were waiting for repair, or 5·7 per cent. of the total stock. In December that had come down to 24,000, or 3·3 per cent.

LOCOMOTIVES AND CARRIAGES.

On June 30, 1919, there were 17,700 locomotives in use, or 1,100 less than in the end of 1913. By December, 1919, that deficiency had come down to 293, and it was still decreasing as new construction was being pushed on. In regard to carriages, the railway companies were not pushing on as fast, as they had to give preference to things more essential. The railways carried in 1919 passengers who bought their tickets for the journey, not season ticket passengers, a total of 156,000,000 more than they had ever carried in any year of their history. In addition season tickets went up by 50 per cent., which was estimated at another 100,000,000, to 150,000,000. As to the quantity of freight carried, he estimated the increase at 20 per cent.

Cars Required for Copenhagen.—The Copenhagen Municipality, according to press reports, propose to purchase a number of new cars. The director has stated that many of the present cars are in a bad condition and are equipped with motors not sufficiently powerful to cope with the present heavy traffic.

A TRANSPORT MAN'S VISIT TO AMERICA.

On Monday, March 29, Mr. C. J. Spencer, manager of the Metropolitan Electric Tramways, Limited, the London United Tramways, Limited, and the South Metropolitan Electric Tramways and Lighting Company, Limited, delivered a lecture on his recent visit to the United States to the staff and employees of the three undertakings. This took place at the Allison Hall, Green Lane, Harringay, and was illustrated by numerous lantern slides prepared from photographs taken by the lecturer.

It will be remembered that Mr. C. J. Spencer, with Mr. F. Pick, commercial manager, Mr. G. J. Shave, manager for maintenance, and Mr. A. R. McCallum, assistant mechanical engineer of the Underground Group, were appointed to visit the United States for the purpose of investigating the transportation position in that country, and to ascertain how post-war difficulties were being met in America.

Mr. E. Garcke, chairman of the Metropolitan Electric Tramways, presided, and in opening the proceedings said that during his visits to the States in the early days of electric traction the main feature that appealed to him was the far-seeing policy of the Americans of scrapping old plant and substituting modern machinery, which enabled them to keep their undertakings in full swing.

Mr. C. J. Spencer, dealing first with the financial position of the street railways of America, said that, like the undertakings in this country, they were seriously affected by the war conditions. Their wages bill generally had increased about 115 per cent., and material necessary to run the undertaking from 80 per cent. to 100 per cent., whilst revenue had not increased more than 9 or 10 per cent.

A striking feature of the American situation was that during the war the riding habit had not increased to the same extent as in this country, with the result that the undertakings over there were sooner in difficulties. In order to increase receipts they had decided to raise the fare level from a five-cent flat fare to varying amounts up to 10 cents. The exception was Philadelphia. Here a co-operative system, analogous to the Whitley Councils in this country, of working with labour, was in operation, which they considered was the solution of all their troubles. In this city they had not increased the flat fare of five cents, and they felt that they would be able to get through all right, and so far the results were satisfactory. On the other hand, certain undertakings were unable to make ends meet even with a 10 cent fare.

ROLLING STOCK.

Mr. Spencer said he was greatly interested in their rolling stock. As he happened to have had the advantage of going to the States in 1902, he was interested to see the changes which had taken place in design in a period of about 17 years. An absolutely new type of car was on the streets to-day which made him think about our own practice in this country, where we were using the same type of car that was in operation twenty years ago.

The first item of interest to which their attention was drawn in the States was what was designated a tramcar graveyard, and it was not very gratifying to see such indications of the decadence of the tramcar. He was assured, however, on further inquiry that although these tramcars had been scrapped, and had been allotted room on spare ground well befitted for a graveyard, they had actually been replaced by tramcars and not by other methods of traction.

The Centre Entrance Car, New York.—The standard type of car in use in New York was the centre entrance car, which was provided with automatic doors. The conductor is seated in comfort with the fare box in front of him, and he operates the door either by depressing a button or by means of a lever. On the passenger boarding the car the fare is paid into the box and the passenger takes his seat. A feature of this car is that the driver cannot start the car until the doors are closed, and by putting his controller on the first notch the car automatically starts sosoon as the doors are closed.

The cars are very heavy, weighing from 20-25 tons, which is one of their great disadvantages. The weight per seat is 970 lb., as against 400 lb. per seat in this country. Some of the newer equipments, however, are of much lighter construction, and they are hoping more nearly to approach our figures. The cars, however, have a great capacity for carrying passengers. They do not reckon the capacity by the number of seats but by the greatest number of passengers they can possibly get into the vehicle.

Omnibuses.—Omnibuses are being used in New York, and are serving a very good purpose, but they are mostly employed in the wealthy districts, presumably because their operating expenses are so high that the company cannot afford to work them at anything less than double the tramcar fare. Where finance is concerned the tramcar will probably hold its own for some time to come.

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Double-deck Tramcars.—Mr. Spencer said he was much concerned to know why the double-deck car in use in London had not been adopted. He was told that the New York tramway companies had experimented with a double-deck car, but it was never popular and was withdrawn from service. On seeing the elevated railway structure in the streets he could appreciate the difficulties of designing a suitable double-deck car. He felt, however, that there were great advantages in the double-deck car, and he had not returned a convert to the single-decker.

Regarding speeds, Mr. Spencer said that the average speed in New York was low, and a ride along Broadway in a tramcar was a rather tedious trip. The average speed to-day was about 6 miles per hour, but in 1902 it was very much less. The congestion, however, of the main thoroughfares was such that a high speed was almost impossible.

Coupled Cars.—On the Cleveland and Buffalo Tramways coupled motor cars have been adopted of a similar design to the New York type, which have been found to be extremely useful in dealing with the peak load traffic. These cars are electrically as well as mechanically coupled, so that two cars are handled by a crew comprising one driver and two conductors. He did not see any more street congestion in having two or three cars running together than there is with running two or three cars separately. In Philadelphia they had adopted a system of coupling three cars on a service handling special traffic between Philadelphia and Hog Island in connection with extensive shipyard traffic.

Safety Cars.—The last word in car construction in America at the present time is in the direction of smallness and lightness. The safety car, which is now being made in very large numbers and supplied to various street railways, is looked upon by almost every manager as his salvation. This car is constructed of very light steel, is fitted with all kinds of automatic devices, and is driven and conducted by one man. The driver, by means of special mechanism, is able to control the doors, and he is also able to take the fares from the passengers as they enter.

Owing to its lightness the car is able to attain a higher average speed than the larger cars, and the expenses of operation are about half. The car has a seating capacity of about 35 passengers—weighs about 7 tons—and is stated to be the answer to the "Jitney" competition.

With these light cars the traffic is handled during the slack hours of the day very efficiently. Their lightness, flexibility, and easy riding make them very popular, so that it is not surprising that American railroad men have gone nap on this particular type. Managers should be thinking of something on the same lines in this country for dealing with slack hour traffic and operating routes where the traffic is never very heavy.

Mr. Spencer referred with pleasure to a trip that they took in one of the "parlour" cars in use on the Detroit system, which are used on special occasions. These cars are luxuriously furnished and equipped with the necessary apparatus for ministering to one's comforts.

Regarding the inter-urban development of tramways in the States, he said that the cars travel up to 60 miles per hour, and give a good service to the rural population. Some such development, he thought, was worth considering for this country.

Brakes.—On the question of brakes, the lecturer pointed out that the old hand brake has vanished. In the States the power brake is universally used. The driver of the car is housed in comfort in a vestibule, and controls the car and, if necessary, the doors, by means of a power handle on one side and a brake handle on the other. He thought the time was not far distant when in this country they would be using power brakes. It was surprising to him that more in this direction had not been achieved.

It was rather difficult to form comparisons of operating costs, but he found that the average cost of running a car in America was roughly about the same as in this country, but it must be remembered that much higher wages were being paid to men engaged on maintenance work. He thought that the various labour saving devices which they employed in the works and on the cars had the effect of lowering the total maintenance cost.

Accidents and Claims.—Dealing with accidents, the lecturer stated that the cost in this direction was pretty bad compared with the practice here. The cost of claims for injury, etc., represented about 10 per cent. of the gross receipts of the undertaking. In Connecticut, however, they had obtained very much better results; in this case the cost was only about 3 per cent. of the gross earnings. On the street railways in New York the accidents worked out at about 400 per 1,000,000 miles run.

The adoption of automatic doors on the cars and the automatic folding step had eliminated platform accidents, whereas in this country the accidents in this connection were a very serious item. The heavy cost in respect of claims for accidents is largely accounted for by the fact that the case almost invariably gets into the hands of an unscrupulous solicitor.

Philadelphia Co-operative System.—The lecturer reported that a co-operative system of working with labour, which they found in operation in Philadelphia, was worth mentioning, as they were getting rather wonderful results. This system is practically an adaptation of what we know as the Whitley Councils in this country.

Interchange Stations for Trains and Tramcars.—The lecturer showed slides relating to the arrangement of interchange stations in Boston, where the surface cars run up an incline and come alongside the elevated railway track, which enables the passenger to change with a minimum of inconvenience, as he is entirely under cover. For a flat fare of 10 cents a passenger can travel on the elevated railway, and change to the surface tramcar at one of these stations without having to trouble to re-book. He thought that there were distinct possibilities on similar lines in this country.

Passenger Checking Contrivance.—The lecturer described a passenger counting contrivance installed at one of these stations which electrically registers the passengers as they enter, and which is considered fool-proof. A very ingenious system of money counting and checking was installed at Boston at the entrance to one of the stations used for tramways, elevated railways, and subways. The passenger, in passing through the barrier, throws his nickel into a receptacle leading to a locked box. From this point the box is taken to a counting-room, and the coins are dropped into a hopper of a machine which selects, counts, and packets the coins. The proud boast is that the fares, after leaving the passenger's hand, are not again handled until they arrive at the bank.

Fare Collecting Systems.—In one case a fare-box is in use which is a fixture on the car, in which the passenger puts his fare and the conductor is there to see that he does it. The conductor is not concerned with tickets, and if he does his duty properly it is practically impossible for a passenger to pass the barrier without paying.

A novel form of zone fare collection is in use on the Connecticut system. The passenger enters the car by the driver's end on the near side, and as he passes the driver he is handed a ticket which indicates the zone number where the car was boarded. The ticket is presented to the conductor, who computes the fare according to the number of zones the passenger has travelled.

Flat Fare.—Mr. Spencer is of opinion that the business is rather unduly cramped and limited in extensions by the adoption of the flat fare, but the advantage is that there is a limit to the distance which a passenger can be carried at a fare which is also attractive for short-haul traffic.

Permanent Way Reconstruction.

At Detroit a most interesting system of permanent way relaying is in operation. The track first receives the attention of what is termed the "bull-nosed alligator." This apparatus is a sort of artificial earthquake manufacturer, and is, in fact, a huge steel casting resembling a plough, which is attached to a freight car and hauled along at almost full speed, tearing up paving stones, tie-bars, etc., and clearing the way for more machinery. After the bull-nosed alligator has finished, the rails have to be pulled up, as that is beyond the capacity of the machine. When this has been done a man comes along with an oxy-acetylene arrangement, and cuts the rails into convenient lengths, which are then removed by a steam crane.

Following the removal of the rails, they bring along a piece of apparatus for smashing the concrete The machine in use comprises a motor capstan which hauls up a huge weight between vertical pillars, which, on being released, comes in contact with the concrete and smashes it to pieces.

Following this a steam crane with grappler comes along to pick up the loose material, which is deposited into a freight wagon and expeditiously removed. A steam shovel is then introduced, which removes what is left into a motor wagon and prepares the trench for the reception of the concrete bed.

Regarding concrete mixing, in Detroit they have an apparatus which is in effect an endless belt, which conveys the concrete and sand received from the freight wagons and tips them into a rotary concrete mixer. When the mixer, which is a separate piece of machinery, comes up alongside and comes in contact with the buffers of the apparatus connected with the endless belt, it automatically opens the sluices at the bottom of the wagons immediately over the belt, and the sand and cement commence to fall. The belt thereupon begins to move, and thus carries its load up the incline to the mixer; the opening of the water barrel follows, and water, sand, and cement pour into the circular concrete mixer. The machine continues to run until such a load of sand, cement, and water have been received as to depress a spring, which cuts off the current and the machinery stops. The driver detaches the mixer, which proceeds to wherever the concrete is required, and while on the journey the drum is rotating and mixing up the material, so that by the time it arrives the concrete is well mixed and in a condition to be used. By means of a lever the driver releases the concrete, and the machine being on the move the material is spread over the trench, and on being levelled out and allowed to set is ready to receive the rails.

The method of laying the rails is very similar to that in vogue in this country, but greater use is made of steam cranes.

On the proposal of Mr. E. H. Bawden, of the United Vehicle Workers' Union, seconded by Mr. W. Harvey, of the Metropolitan Electric Tramways, a cordial vote of thanks was accorded Mr. Spencer for his interesting lecture.

Mr. A. L. Barber, secretary to the company, proposed a vote of thanks to the chairman, which was carried by acclamation.

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THE EDITOR will be glad to consider articles by experts. All information of a practical character relating particularly to the engineering and operating branches of transportation will receive prompt attention. Original illustrations will also be welcome.

LONDON, APRIL 15, 1920.

The Tramway Settlement.

The settlement which was arrived at on the tramwaymen's wages question after the prolonged negotiations of March, together with the accompanying circumstances, can only be regarded with mixed feelings. There are features which are satisfactory and there are some which are the reverse. For example, it is all to the good that the Joint Industrial Council for the industry has actually got to work on a big national problem; but on the other hand it is tolerably clear that unaided the Council would not have come to an agreement. A paragraph, evidently inspired by the Government, appeared in the daily newspapers lauding the settlement as a great success for the principle of Whitley Councils. As a matter of fact, that principle in the present case had little chance of operating until the Government produced their Bill to enable tramway undertakings to raise their fares. On the one hand, we had the employers' representatives admitting that there was a case for some increase of wages, but demonstrating absolutely that the financial position was such that no increase could be granted. On the other hand, we had the workmen's representatives unbending in their demand for the full amount for which they had originally asked. Not only so, but their trade union called a strike at the very time when through Government action the possibility of an agreement was coming into sight. Not much of the spirit of conciliation was there. It is gratifying that the Ministry of Transport became so convinced of the necessity of enabling the tramways to raise more revenue that it introduced the necessary Bill in Parliament. The reflection on that action is that it might have been taken sooner; it was only taken when a crisis had almost been reached. The Bill was hastily drawn up, and it will really be of small advantage even for the limited period its powers are to run. Yet it was regarded by the employers' side of the Council as justifying the offer of an increase of 6s. a week. Then, however, the value of the Council was shown, for the employees' representatives accepted the offer as a compromise.

Wreckers.

The lesson is tolerably clear that in the case of all Whitley Councils, if both parties have a free hand, agreement can be reached on a compromise basis. The employers must be financially able to make an offer should they consider that desirable, and the employees must be at liberty to reduce their original demands. In both cases a spirit of conciliation is necessary. But there is a further element necessary for success, and that is a certainty that the mass of the workmen will loyally accept the decision arrived at by the Council. Many a settlement has been reached between employers and the heads of a trade union which has been disavowed by many members of that union. So in the present case, the settlement which was reached by the Council produced a rebellion among wreckers and extremists in various towns in England. These extremists went on strike, denounced the national settlement, and repeated the original full demand for an increase of 10s. a week. If that sort of thing is to go on in either the tramway or any other industry, what is the use of setting up Whitley Councils? If workmen want to save industry and themselves from anarchy, they must adhere as loyally to the decisions of their Joint Industrial Councils as the employers do. Otherwise, not only Whitley Councils but trade

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unions will find their existence at stake. Responsible trade union leaders recognise these things and do their best to secure the observance of agreements, but their difficulty is to control the firebrands. The latter do not realise all that organisation means, and apparently their minds cannot be opened except by a process of education on the lines of reason, justice, and a fair regard for the interests of others as well as of themselves. The strikers, however, went back to work on the understanding that the Joint Council would further consider their full demands for an advance of ten shillings per week.

Municipalities' Peculiar Position.

A curious and interesting point emerged in the course of the negotiations in connection with the question of raising fares. It might have been foreseen by the local authorities; perhaps it was, but if so it was never mentioned. The Ministry of Transport Act enables the Minister to take "control" of tramway undertakings owned by companies, but municipal tramways are outside the scope of the Act. When that measure was before the House of Commons last year, Sir Eric Geddes mentioned the above fact, and he put forward the somewhat peculiar reason for excluding the municipal undertakings that the latter were as a rule financially prosperous. Whether that was a good reason or not, it does not exist now. The fact that no voice was raised in Parliament on behalf of the local authorities asking that they should be brought within the scope of the Act shows that they did not want to be included. If we remember rightly, there was also a certain class of canal undertakings which were excluded from the Act, and it has since been stated in Parliament that the owners of some at least of these canals would now like to be brought in. It would be interesting to know if any of the municipalities owning tramways have wished within the last month or two that their undertakings were "controlled." Sir Eric Geddes pointed out in the House of Commons on March 29 that the Government had no authority from Parliament to increase the charging powers of the undertakings owned by public authorities, but that there was power under the Act to raise charges in the case of company-owned undertakings. It was, however, obviously impossible to put up the fares on the companies' lines while leaving the municipal ones as they were. Hence the necessity for the new Bill applicable to both classes of undertakings. From this it is plain that if municipal tramways had been under the Act, the Minister of Transport could simply have issued an Order enabling both clasess of tramways to raise their fares in order to meet the soaring costs of operation. There would have been no delay and no trouble about that. But it is always easy to be wise after the event, and in any case the municipal spirit is of such a kind that probably it still prefers exclusion from the Transport Act, even though that exclusion brings certain trouble in its train.

Housing Without Transport.

Out on the Thames-side wilds at Dagenham, in Essex, beyond the boundaries of London and those of intervening East End boroughs, the London County Council have decided to erect, under the new Housing Act, a town of 24,000 houses. In our issue of February 7 we criticised the Housing Committee of the Council for having put forward the proposal without having considered the provision of travelling facilities for the huge population, to say nothing of the navvies and artisans who are to lay out and build this new borough of Greater London. As the population will consist mainly of dock hands and others who will find their employment in the Metropolis, the matter is one that will become pressing as the development of the locality takes tangible form. All that the chairman of the Housing Committee could say, when charged with lack of foresight at the meeting of the Council on February 3, was that when the Council built a town ways of getting to it would be found. Apparently the Housing Committee are content to leave the matter to the railway company whose line runs through the estate of 3,000 acres, but the most sensible course to pursue would be to confer with the Highways Committee, who are responsible for the construction and working of the Council's tramways. Even if the latter committee decided that at the outset the transport of labour could be accomplished without the construction of a line to link up with the tramways of East London authorities, there would

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still remain the commonsense procedure of inviting the Highways Committee to take a hand in the planning of the roads, so that tramways could be constructed upon a sleeper laid track at the side. It is highly probable, too, that the tramway manager could devise a scheme which would effect economy of haulage of building materials, which are to be brought to the railway siding on the estate and also by river. Reporting to the Council on March 9, the Housing Committee stated that to build 24,000 houses in five years is a greater task than the Council have ever before taken in hand, and in view of the difficulties of co-ordination of transport, labour, and supplies, the work should be carried out by contract. They estimate that the contractor will have to handle over 2,500 tons of material a day, and as the existing roads will not be of much value for the conveyance of material, it will be necessary to make arrangements for the transport to be effected by an internal railway system from the sidings within the area and from a riverside wharf. The need for the internal railway system, which will be of a temporary character if laid by the contractor, emphasises the necessity for laying at the outset tracks which can afterwards form part of the scheme of passenger transport. Further, it is reasonable to expect that in the creation of so extensive a town that the tramways should be available for the transport of goods from the extensive railway depot which must ultimately be erected. Nowadays the economical use of transport is imperative, and that end can be best attained by planning tramways to serve a dual purpose.

Decimal Coinage Shelved Again.

In the recently published report of the Royal Commission appointed to consider the advisability of introducing a system of decimal coinage, thirteen out of the twenty members recommend a continuance of the present system. This decision is, of course, due to the difficulties, real or supposed, in the way of any change, and is largely based on the findings of the Commission of 1856. Of the evidence gathered by the present Commission from a hundred and thirty-seven persons, mostly representing the opinions of important bodies, 74 per cent. were in favour of a change from the mixed system, and only 6 per cent. were definitely against a change. The opposition, according to the majority report, is to be found among the "inarticulate masses"; but as only one reply was obtained from the trade unions questioned, they, at all events, cannot be seriously hostile. In spite of this lack of interest the report declares that a change in the value of the penny would entail grave industrial unrest. In view of the international goodwill of sterling, the Commissioners, with only three exceptions, are in favour of retaining the pound, and accordingly the penny would have to be sacrificed in any decimal system. The form receiving most support is that known as the "pound and mil" coinage, provisions for which are embodied in Lord Southwark's Bill now before the House of Lords. The difficulties, though great, are probably not so serious as is made out, and would be worth encountering in order to gain the advantages now enjoyed by those countries where the decimal system is already in use. As the witness of the Tramways and Light Railways Association explained to the Commissioners, the 5-mil piece with a value 20 per cent. above that of the penny would avoid heavier increases in tramway fares than would otherwise be the case, and in some instances allow of longer stages, while the new system would be much more convenient for fare collecting and the giving of change. The majority report refers to the advantages of the existing system, particularly to the use of the dozen, with its greater number of factors. This, indeed, is claimed as an advance of civilisation. Any advantages it has to offer, however, cannot compare with the trouble it causes through disharmony with our system of notation. Until the time comes to introduce duodecimal calculation, we cannot do better than aim at consistency in all units of measurement by the introduction of decimal coinage and the metric system.

RAILLESS TROLLEY CARS FOR LONDON.

The Highways Committee of the London County Council propose to experiment with railless trolley cars on the Eltham route. The Committee intend at first to obtain two cars for the purpose of the test, and these will be run experimentally to see how they interlace with the tramway service. The main reason for the test is the present high cost of tramway track construction.

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THE INSTITUTE OF TRANSPORT

PRESIDENTIAL ADDRESS OF SIR ERIC GEDDES AT THE INAUGURAL MEETING ON MARCH 22

Sir Eric Geddes, M.P., the Minister of Transport, presided at the inaugural meeting of the Institute of Transport held on March 22, at the Institution of Civil Engineers, Westminster. The attendance included Lord Ashfield, Sir John Griffiths, Sir Maurice Fitzmaurice, Sir H. E. Walker, Sir Sam Fay, Sir George Beharrell, Sir Hy. Maybury, Messrs. C. Aldington, H. E. Blain, Mr. H. A. Watson, Mr. J. B. Hamilton, Mr. R. J. Howley, and many others.

Sir John Griffiths, president of the Institution of Civil Engineers, welcomed the president and the members of the new Institute, and Sir Eric Geddes, having replied, delivered his presidential address, which was substantially as follows—

In making the first address as the first President of this Institute I would like to acknowledge the great honour which the members have done me by so electing me. If I may say so, it is a not unhappy coincidence that the first Minister of Transport should be your first President. In years to come, I hope that we may have our own premises. Meanwhile we are fortunate in being allowed the use of this lecture theatre, and I am sure I voice your wishes when I acknowledge the hospitality and great courtesy of the Institution of Civil Engineers in permitting us to meet in their very handsome hall.

The energy of those who conceived and assisted at the birth of the Institute of Transport and the general support which it has already attained augur well for its future growth, influence, and success. To those pioneers our thanks are due.

Transport and the State.

I wish to speak to-night about transport in relation to the State. During the war, and still more since the war, the public has for the first time learnt to appreciate that the services which transport renders to the community are absolutely vital. My own feeling is that, before the war, the public were singularly lacking in consciousness of their dependence upon transport, and of the real community of interest which existed between the great transport agencies and themselves. In my own experience, this was peculiarly so in our own country, and more especially so in relation to railways.

In spite of the fact that the railway property is owned in this country by the small investor, and in spite of the fact that the return on capital has always been a modest one, generally speaking, the railways have figured in the mind of the masses as a great bloated capitalist organisation, an object not of sympathy but rather of suspicion and jealousy. The roads were something that the public felt they had a right to, just as they had a right to breathe the air. The docks were mainly locally owned, and received a kinder and less critical consideration from the local public to whom they very largely belonged. Canals figured less in the public eye than other means of transport. They never came into the mental picture of bloated capitalism, because they were more in the nature of turnpikes, and the carriers on them were not great statutory bodies far aloof from the public, but private individuals or at most ordinary trading companies of modest size.

It took the cataclysm of war and the consequent enormous rise in the cost of living to bring home to the public consciousness—even to the extent which has been attained to-day—the fact that the transport of the country requires a co-operative effort, and that the transport agencies are not the enemies, but the partners, of the community.

Private Enterprise and Competition.

It is a remarkable fact, but I believe it to be a fact, that if we confine our view to the great countries, only two of them, England and the United States, have ever based their railway policy on a régime of practically uncontrolled private enterprise. Both these countries began by assuming that railways, like turnpikes and canals, would be public highways, along which rival carriers would compete for custom. When this was seen to be impossible, and it was seen at a very early stage, both countries turned to competition between rival companies, each over its own route, as the means of securing adequate public service. Legislation to deal with proved evils and special Courts to enforce the law gradually followed.

Even before the war, it was evident that this system was breaking down, and the idea of unbridled competition was giving place to that of a regulated monopoly. It was gradually becoming recognised that State control had to be administrative, rather than legislative and judicial. In England and in the United States, public bodies—here a royal Commission, and in the United States a Joint Committee of both Houses of Congress—had been set up to investigate the subject. The main operative words of the two references were, in this country "to inquire into the relationship between the railway companies and the State"; in America, "to investigate the subject of Government control and regulation, and of Government ownership."

The New American Scheme.

The war brought the railways of both countries into the possession of the Governments. Since March 1, the Government of the United States has handed back to the owners the railways which were operated by it during the war. A new act has simultaneously been passed which, having regard both to the scope and novelty of its provisions, and to the magnitude of the interests affected—250,000 miles of line and a capital of over £3,000,000,000—may safely be described as the most important Railway Act ever placed upon a statute book. Let me summarise to you very briefly the leading features. Provision is made for the reduction of separate companies to approximately 15-20, each operating vast properties of about 15,000 miles of line. The powers of the Interstate Commerce Commission, the controlling public authority, have been greatly enlarged. Congress has recognised a return of some 5½ per cent. or 6 per cent. on the value of the property as the minimum wage which will enlist new capital. To deal with labour questions an organisation has been established resembling in many respects what we have tentatively set up in this country. There are to be established voluntary Boards of Labour Adjustment, which may be either sectional or local, to deal with disputes, involving only "grievances and rules and working conditions." There is also a statutory Railroad Labour Board of nine members, three representing labour, three representing the companies, and three representing the public. They are to be appointed by the President with the consent of the Senate; and they each receive a salary of £2,000 a year. Their duty is not only to hear appeals from the Adjustment Boards, but also to decide all questions of wages. Elaborate rules are laid down as to the various matters which they are to take into consideration in fixing scales of wages and standards of working conditions which shall be just and reasonable. In other words, the United States—unhampered, as we were, with an agreement to retain control of the railways and guarantee their net revenue for two years after the conclusion of the war—have said to the companies, "We will enable you to earn a living wage on your capital, and we will adjust the rates in order to enable you to do that; but in return we propose to see that you are operated in the best interests of the community, and to give you certain orders as to what, from time to time, a competent body decides you must do."

Action by Other Countries.

The United States is not the only country which is occupied at this moment in setting its railway house in order. In Germany from April 1, all the railways will be unified as a single federal system. In France, schemes are under consideration for increased control, to be exercised by a central Board under the Ministry of Public Works, with the object of attaining a greater measure of unification both operating and financial. In Canada, the whole of the railways, with the exception—an exceedingly important exception, I agree—of the Canadian Pacific, are being brought together under the management of a single company, the Canadian National Railways, in which the sole shareholder is the Canadian Government. In this country we are still bound by an agreement entered into in 1916, that the control of railways, together with the financial guarantee, should continue for two years after the war. That was a promise which the railways sought from the government, and which the Government of the day made to them, and which has to be honoured by the present Government.

As I have already stated, this country and the United States have been the main fields of free competition by private companies, though in the United States, even before the war, regulation by public authority of charges and services had been carried much further than with us. Other countries—their number is considerable but their total railway mileage is only about the same as the mileage of the United States alone—have regarded national ownership as the best method of securing that their railways shall be worked in the interest of the whole community.

National Ownership.

But so far as I know, no country has ever adopted national ownership for theoretical reasons. I believe that it has always been a question of practical policy to meet the actual necessities of the moment. In Belgium and Switzerland State railways were adopted lest foreign capital should obtain control; in Italy, to cut the entanglement of badly drawn leases; in Japan, to terminate concessions to companies which prevented reductions of rates believed

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to be required in the public interest ; in Australasia, and in the early days in East Prussia, because railways were necessary, and private capital would not build them ; in Germany, after 1870, in Russia, and in the North-West India, primarily for military reasons. In Canada, the Canadian Northern and the Grand Trunk systems have just been nationalised because the companies had ceased to be able to carry the burdens which they had been encouraged by the Government to assume. I do not propose to embark to-night on a discussion of the pros and cons of State ownership. I have sketched to you in very brief outline the reasons why in many countries the vital influence of transport services on the public welfare has resulted in State ownership. I have shown you how in the United States, which after two years' experience of temporary ownership and operation by the federal Government has by almost unanimous consent reverted to private management, the liaison between the Government and the companies has been strenghtened and improved. And I have called your attention to the curious fact that this country, the first to develop modern transport, has been the last to recognise the intimacy of the relation between the transport agencies and the public welfare.

Present Financial Position.

I now invite you to consider the present position of the transport agencies of this country and the lessons which in my judgment we must draw from it. None of these agencies are able to carry on on the basis of their pre-war revenue. This, as you all know, applies to railways in a marked degree. It also applies to roads. The possible road revenue of the various highway authorities has ceased to suffice to keep the roads at present costs of maintenance up to standards which modern transport demands. Canals cannot live at present costs and at present rates. The advocates of canals regard them—possibly rightly—as the advocates of roads regard good highways—namely, as something to be provided by the State, and eventually, if possible, to be freed from tolls, so that the craft may come and go at will over the canal system of the country just as a motor car can come and go at will over the road system of the country. But as at present worked they show no signs of being commercially self-supporting. Tramways are almost without exception in the position that, with the pre-war powers of charge, they are unable to meet the present-day costs of operation. Dock undertakings are in the same position throughout the country. Existing light railways cannot meet present-day expenses without greatly increased charging powers, and no new light railways can be built unless they are allowed charging powers above the scale hitherto in force, and in addition their capital expenditure is minimised by every possible relaxation of restrictions in reference to methods both of construction and operation.

So the State is faced with this : under pre-war conditions of revenue, no one single transportation agency can continue to exist. And yet their healthy existence and development is vital to the State. And at long last the public are coming to understand this.

Maximum Charges Insufficient.

Wherever there were statutory undertakings, whether in the hands of companies or public authorities, the position was this : that the State authorised the undertakers to embark upon the provision of certain facilities for the public benefit, and gave them statutory rights to enable them to provide those facilities, but imposed a condition that certain charges were not to be exceeded in the interests of the community, and that the monopoly or comparative monopoly —or at any rate the protection from unbridled competition—should not be used to exploit unduly the public dependence upon transport. Now we must admit that those maximum charges are no longer sufficient to enable undertakings to operate and exist as a healthy part of the social and industrial structure of the country. It is therefore for the community to review the whole position, and to say to its servants, its statutory agents : " We made a bargain with you, that you should give a certain service at a charge not exceeding a certain amount. We admit that the amount as laid down then is not sufficiently high to enable you to be a healthy, prosperous undertaking. Apart altogether from any question of ownership, it is necessary that the transport undertakings of the country should be sufficiently prosperous to keep abreast of the times, to give an efficient service, and to be able to face a reasonable amount of development expenditure. In other words, you must be able to raise money, and money cannot be raised unless it can earn its keep."

Amalgamation.

But if the community agrees to alter one side of the bargain in favour of the undertakers, whom it has brought into being and protected by statute, is it not also entitled to say : " But let us also review, at this juncture, the other side of the bargain. The bargain was not all on one side, and there is no reason why it should only be altered in one direction. We, the community, realise more than ever the great interest we have in those undertakings. The burdens of taxation and cost of living are high. We cannot afford to be as generous as perhaps we would wish to be, and we must see whether there are any means by which we can reduce the cost of transport by alteration of the system. There have been imperfections in our relationship with the transport agencies ; too much freedom was given you to fix or refuse rates as you thought fit within the maximum, there was no power to require a reasonable standard of service, and we had to rely upon competition to obtain that. This competition causes waste. The transport agencies of the country grew up without co-operative effort, but with competitive effort, in district after district. We now think it would be better to give you the amalgamations which many of you have sought, and which have been refused you because of the fear that they would be used to oppress the district served. We will permit—we will even encourage—the amalgamations, for economy's sake, but we will provide a means to prevent a local monopoly being used oppressively."

Again, let me make it clear, that this applies, who ever owns the transport agencies. If you had State railways, you would have to divide them into districts. One district would be criticised in comparison with another in its operating results, and the local managers of these great districts, wishing to show good operating results, would naturally restrict the less remunerative services. It would be necessary therefore, to provide a national control over the local agents, even if these agents were State officials. I merely mention that, in passing, to indicate that I am not looking at this problem to-night from the point of view of ownership at all.

Reduction of Costs.

Then again, when asked to increase the charging powers of its statutory agents, is the State not also entitled to say, " Yes, that part of the bargain must be altered, but the community now sees that greater economy can be obtained in transport if the locks on the through routes of canals are made of the same dimensions, so that a canal section with narrow, short, or shallow locks may cease to prevent the use of larger craft. Or again we see that economy by the use of large wagons on railways cannot be achieved unless the dock authorities conform to the highest and most modern standard ; or that larger wagons or faster trains cannot be run on the railways because certain companies refuse to conform to a standard brake or a standard loading gauge. We must have powers to alter this state of affairs ?"

In these matters, the community may well say, " We wish to be assured that in agreeing to increased charges, we are reducing costs in every possible way."

Even in roads, the same applies. It was recognised when the Road Board was formed that local effort could no longer provide roads of the required standard. Experience has shown, however, that it is not only in respect of the provision of new roads, but also in respect of the maintenance of existing roads, that modern traffic imposes increased charges. Accordingly a classification of roads, in reference to width, construction and alignment, is already being undertaken throughout the country. The Ministry of Transport Act has said, " The revenue of the Roads Department which the State provides for development and improvement of roads will be granted, provided the community has a say as to the standard to which through roads are to conform "

Then again, the community has a right to say, " If we alter the bargain as to your charging powers and allow you to take more out of our pockets for the transport which you sell us, are we not entitled to be supplied with figures which will show us that the management of your undertakings is so efficient and so economical that the additional burden of higher charges imposed upon the community is reduced to the lowest possible point ? "

The Labour Question.

Again, if the community is to give increased charging powers, has it no right to say, " Experience of labour questions has shown us that it is no longer possible to go on with the pre-war system of railway companies fighting out their fights with labour, to the disaster of the community ? " Is it conceivable that the community can at any time stand by and see the railways and the railwaymen fight to a finish, while the community starves ?

In these matters, and in others, the community has a right to say that it must be considered ; that conditions of labour have changed ; it has a right to say what is a reasonable service for a statutory company to perform, what reasonable improvements should be made, what reasonable rates should be charged. Surely the community has an undeniable right to say that conditions have changed, and to say that it has learnt by experience.

My list is by no means exhaustive—and I would remind my audience that I prefaced this portion of my address with the expression of opinion that no country's transport which was unable to have a financially healthy existence could be good for the State. But I have said enough, I hope, to indicate the direction in which, in my opinion, the community has undoubted rights, whoever owns its transport system. Last, but not least, of these rights is the right of the man in the street, who can think on such matters, and can use such information as modern costing and accounting systems supply, to know, accurately and sufficiently comprehensively, that the agency which he has appointed, and to which he has given statutory protection and statutory rights, is managing the property concerned and giving the services required in an efficient and economical manner.

Operating Statistics.

The only way that that information can be given to the man in the street who pays the piper is by giving him full, accurate, and " live " statistics of operation.

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I do not want to-night even to get upon the fringe of the ton-mile controversy—although I think there is very little even of the fringe left. But whatever figures are necessary for a proper criticism of the management of transport undertakings, they ought, without any doubt or hesitation whatsoever, to be provided at the request of the State by every statutory transport undertaking.

With these figures the community, through its expert critics—official and unofficial—can judge of the services rendered to it, and whether the cost is reasonable or not. By these figures the labour employees of our transport agencies can see what margin there is for them.

I hope that before the temporary provisions of the Ministry of Transport Act die, Parliament, in its wisdom, will have seen fit to make it obligatory upon every transport undertaking which is protected by statute at all, to provide figures at a time and of a kind laid down by the Government, so that they can be published, and so that the work done and the cost of that work can be accurately compared and considered as between one management and another. Without these figures suspicion—which is bred throughout the world, and throughout all classes of society, and in all the ages, through ignorance—will never be dispelled.

Suspicion and Ignorance.

It was suspicion bred of ignorance which created, in my humble opinion, the unfortunate pre-war attitude of the people of this country towards the great transport interests which served them, and which they had brought into being. And if the Institute of Transport by the scientific study of the various aspects of transport, and of the various factors which go to make for good or bad management, as also by the study of the measures which can be taken to economise in transport, brings a more educated and a more critical judgment to bear on transport results, it will be performing an invaluable service to the country.

Co-ordination and Harmony.

I have spoken so far of the relation between the State as representing the community on the one hand and the individual transport undertakings on the other. But this is not all. The State must also harmonise the operation of the different agencies as between themselves in the interests of the community as a whole. Under a system of competition not only did one railway or one dock strive to divert traffic from another, but trams sought to wrest traffic from railways, railways to wrest traffic from canals, coastal service to wrest traffic from both, and so on. In future our effort will be, I hope, to encourage each agency of transport to undertake that part of the total work which it, owing to its own special qualities, can most efficiently and economically perform. On the question which traffic naturally belongs to a railway or a tram, it is too much to expect that a railway or a tramway manager will be wholly impartial. The Institute of Transport should be in a position to study questions such as this in a detached and impartial manner. Our transport system of the future should develop on a basis of creation rather than piracy.

To one phase of this broad question I would call your special attention. The development of agricultural districts is an urgent problem. The development of new housing areas is even more urgent. It is largely in each case a question of transport, railways, light railways, extension of urban tramways, especially of road motor service—all can help in solving the problem. The proper function of each, the proper co-ordination between them, if two or more different agencies are required, these are matters which need, and which I trust will receive from you, the consideration which their importance and the public necessity justify.

I will mention one point more. The railways suffered badly in the old days of the "battle of the gauges." How many millions of wasted capital have in consequence been squandered in perpetuity I make no attempt to guess. In later years they have suffered, and are still suffering, from lack of uniformity in brakes. Perhaps some student of the Institute would like to calculate the annual ton-mileage of duplicate brake fittings which are at present hauled about the country.

Scope for the Institute.

We are on the eve of great extensions of the application of electricity to railway traction. This Institute can hardly perform a service of greater practical utility than to act as an impartial umpire—if I am not too bold in venturing the instance—in the battle between alternating current and direct current, remembering always that the scientifically ideal best is not necessarily the same as the best practically possible.

It is fortunate and opportune that this Institute has been established at a time when a revolution is taking place in the organisation of transport in this country. In selecting a subject for my talk to you to-night, I have thought it useful at this, the inaugural meeting, to lay stress—briefly, I confess, and imperfectly I fear—on the great fundamental truth that the interests of the community and the interests of the transport agencies are one. There must be constant conference and co-operation both between the various transport agencies and also between these agencies as a whole and the Ministry of Transport as the representative of the community which they serve. We must all realise that, as the community pays, and gives to the various agencies the statutory protection and rights which they enjoy, it is entitled to have a say as to the services performed, as to the charges levied, as to the smooth running of the industry; and that with this object it is entitled to accurate comparative statistics and figures which will enable it to judge with intelligent certainty the work of those by whose skill and devotion it profits and for whose mistakes it pays.

On the motion of Lord Ashfield, seconded by Sir M. Fitzmaurice, a hearty vote of thanks was accorded to the president for his address.

Mr. H. E. Blain, the honorary secretary, stated that the membership of the Institute at the inaugural meeting was 231, with 207 associate members, making a total of 438. Arrangements had been made, he announced, that on April 19 Sir Henry Maybury would read a paper on "Roads—A Review and a Forecast," in May Sir H. W. Thornton would deal with "Some Railway Operating Problems," and in June Sir Joseph G. Broodbank would review "Some Problems of Port Administration."

PAY OF MOTORMEN AND CONDUCTORS.

Leeds Corporation now pays experienced drivers £3 7s. 9d. for a 48-hour week, and in addition provides his uniform and grants eight days holiday with pay.

Birmingham.—The financial effect on the undertaking of the proposed increase of 10s. per week would mean an addition of between £60,000 and £70,000 per annum in the wages bill. The advance made in October last of 5s. per week aggregated about £30,000 per annum. At the present time the motormen are paid 64s., commencing, and 70s. maximum. Conductors 60s. 6d. minimum and 67s. maximum.

Sheffield.—The top rate for motormen in Sheffield with fourteen years' service is £3 9s. 8d. for 48 hours, and this includes 4d. per day for a gold star merit badge. The top rate for conductors is £3 5s. per week. The motormen's minimum rate is now 1s. 4½d. per hour (or £3 6s. per week) and that of conductors 1s. 3½d. per hour (or £3 per week). For working on Sundays time and a quarter is paid, and the employees work on alternate Sundays only, so that the extra time is divided into two weeks. If the employee is called upon to work overtime he is paid at the rate of time and a quarter.

Pontypridd.—Pontypridd Tramways Committee have considered an application from the tramway employees for an increase in wages so as to bring them up at least to the figure paid to labourers and scavengers. Mr. J. E. Teasdel, the general manager, said that motormen were being paid 1s. 5d. per hour, whereas the wages of labourers had been increased to 1s. 6½d. per hour. The increase desired would add the sum of £1,300 to the expenses, and he therefore urged the necessity of considering the revision of fares. He estimated that with this increase wages would absorb 55 per cent. of the traffic receipts, as compared with 35 per cent. in pre-war days.

Edinburgh.—It is estimated that if the full demands of the men were granted Edinburgh Corporation Tramways would be saddled with an additional charge of between £60,000 and £70,000 a year. The last increase in October last is costing the department at the rate of £30,000 per annum, and this, together with the general increase in the cost of material, will make it impossible for the department to carry on with the present fares. A special sub-committee has consequently been appointed to review the whole position of the department, and to consider the question of increased fares.

Leicester.—At Leicester the present bonus is 34s. per week, and this is paid in addition to the pre-war rates of 32s. If the present application were granted the average total wage will be increased from 66s. to 76s. It has been pointed out that the steadily increasing demand for more pay on top of the greatly enhanced cost of all materials was creating a very difficult position.

PROPOSED NEW MOTOR TAXES.

The interim report of the Committee appointed by the Minister of Transport to consider the question of the taxation of road vehicles was issued on April 15. The following rates are suggested as adequate full rates of taxation—

Motor-cycles (including motor scooters) up to and including 200 lb. in weight, £1 10s.; over 200 lb. in weight, £3; all motor-cycles with the right to draw trailers or side-car, £4; other motor three-wheelers (excluding vehicles for invalids not exceeding 5 cwt. in weight, exclusive of any batteries), £4; vehicles for invalids not exceeding 5 cwt. in weight, inclusive of any batteries, 5s.

Private Motor Cars, £1 per unit of h.p. with a minimum of £6.

Tramcars to be chargeable as hackney carriages as at present in the Metropolitan area, and such other districts as the Minister of Transport may define, 15s.; in other districts, 15s.

Hackney Vehicles with a seating capacity of 1-5, £15 and £12 respectively for those districts. Seating capacity 6-14, £30 and £24; 15-20, £15 and £36; 21-26, £60 and £48; 27-32, £72 and £60; over 32, £84 and £70.

Commercial Goods Vehicles not exceeding 12 cwt. unladen weight, £10; exceeding £12 cwt., 16; exceeding one ton, £21; exceeding 2 tons, £25; exceeding 3 tons, £28; over 4 tons, £30.

Any of the foregoing with the right to draw trailer, £2 additional.

Motor tractors classed as heavy motor cars, £21.

Road locomotives and agricultural engines not exceeding 8 tons unladen weight, £25; exceeding 8 tons, £28; exceeding 12 tons, £30.

Agricultural tractors used on roads, for haulage solely in connection with agriculture, exceeding 2½ tons and not exceeding 5 tons unladen weight, £6; exceeding 5 tons, £10.

Driving licences are rated at 5s., and horse carriage licences remain as at present.

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THE LONDON TRAFFIC PROBLEM.

REPORT OF ADVISORY COMMITTEE.

The report of the Advisory Committee on London Traffic was issued on March 25, and its main proposal is the setting up of a permanent Greater London Traffic Authority.

The chairman of the Committee, Mr. Kennedy Jones, M.P., was appointed by the Prime Minister, and the other members were appointed by the Minister of Transport on the nominations of various bodies. These members were Sir Charles M. de Bartolomé, K.C.M.G., C.B., Mr. Francis Dent, Mr. Frank L. D. Elliott, C.B., Mr. George H. Hume, Sir Henry P. Maybury, K.C.M.G., C.B., Mr. H. Lyon Thomson, Mr. Will Thorne, M.P., and Mr. Edgar S. Underwood, F.R.I.B.A. The secretary was Mr. J. A. Champion, O.B.E. The Committee met for the first time on November 10, 1919, and held regular sessions till March 18, 1920, when their report was unanimously approved.

In a letter prefixed to the report from the chairman to Sir Eric Geddes, Minister of Transport, attention is drawn to various points, including the following—

Immediate and effective action is imperatively needed in view of the actual and increasing congestion of all forms of traffic, and the serious financial embarrassment in which all operating forms of transport now find themselves.

Remedial measures are alone possible by the complete remodelling, co-ordination, and increase of existing powers of control.

Such reform as is needed can most advantageously be provided by the creation of a Greater London Traffic Authority.

The financial department of the Ministry furnished the Committee with an excellent analysis of the working results of the two main operating undertakings, the further examination of which should be productive of a definite policy covering the whole system of fare charging in Greater London.

The report, which is of considerable length, refers at the outset to the appointment of and the valuable work accomplished by the Technical Committee appointed by the Advisory Committee. In this connection the work actually accomplished by the two committees in connection with stopping places for tramcars and omnibuses, co-ordination of street repair work, varying the times for beginning and ending hours of work so as to spread out the peak load, and so forth, is reviewed. The Committee, it should be noted, are in favour of adopting a left-hand rule for the footpath, instead of the present right-hand custom.

Present and Future Needs.

Under this heading the report says that the transit facilities of London are no longer equal to the demand made upon them. The following statement, which has been prepared by Mr. Spensley, of the London County Council, in continuation of the tables in the report of the Select Committee on Transport (Metropolitan Area) illustrates this—

—	Number of Passengers (Millions)				Journeys per head, 1919
	1905	1914	1918	1919	
Tube Railways	69	147	254	266	36
District Railways ...	56	85	133	140	54
Other Local Railways ...	180	172	223	253	
Total Local Railways...	305	404	610	659	
Tramways ...	478	844	992	1,053	143
Omnibuses ...	291	757	682	861	117
Total ...	1,074	2,005	2,284	2,573	350
Population ...	6,857,694	7,419,704	6,784,480	7,356,653	—
Journeys per head ...	157	270	337	350	—

The figures for suburban traffic on main lines are very problematical, but it has been estimated on good authority that there were, approximately, 468 million passengers for the year 1919. This increases the number of journeys per head to 413

If transport facilities are to be commensurate with popular needs there must be established an authority quick to realise the requirements not only of the present but also of the future.

The Advisory Committee, at an early stage of their work, realised the impossibility under existing conditions of proposing extensive reform, and devoted their attention to the vital question of the future control and regulation of London traffic. The recommendation for the establishment of a traffic authority has never been carried out by any Government to which it was made, for the reason that the opposition of what may be called "vested interests" has always been feared.

We do not, the Committee say, visualise an authority with omnipotent power over all forms of London traffic attempting to combine control with operating functions, since thereby a monopoly would be created which might have serious results for the public, and which could only be instituted by summarily dispossessing local authorities of all their statutory duties and powers. Therefore, as was done by the Select Committee of the House of Commons in 1919 and by the Royal Commission in 1905, we set forth the need for the creation of a London Traffic Authority, and we regard it as a measure of extreme urgency.

Financial Considerations.

The need for the creation of a London Traffic Authority is made the more urgent by the serious financial condition of the traffic undertakings at the present time. The undertakings are financially embarrassed and are unable to extend their operations. London requires new tube railways, in all cases linking up with main line railways; new tramway extensions; a more scientific development of omnibus traffic; and, above all, a just and true perception of the proper functions of each form of transit in order that wasteful competition may be avoided, and each used to its highest efficiency.

One vital problem which any traffic authority must solve before it can hope to evolve a considered and generally accepted policy, is the problem of fixing the relative functional values and the specific uses of the various forms of transport. Much further time is required for discussion of the problem before definite conclusions can be reached. It must be established where, why, and when train, tram, or omnibus respectively is to be regarded as the most suitable form of transport.

It is clear that present needs require large expenditure for the extension of existing and the provision of additional travel facilities. As a general rule, we lay down the principle that no traffic undertaking should be worked on other than a sound financial basis. In the case of private companies such undertakings are often grouped together, with an aggregate of vast indebtedness, represented by capital actually expended or "evolved," often vaguely specified and further depreciated far below its face value. These private companies show a tendency, as in all forms of commercial and industrial life, to pool receipts with the object of obtaining mutual aid both in operation and financial benefit.

As regards the Underground Electric Railways group of companies (commonly known as the "combine"), it must be pointed out that Parliament in 1915 sanctioned by Act such a pooling arrangement. A further issue is raised when the suggestion is put forward, as it has been, that fares should be substantially increased on an undertaking which is already remunerative in order to help an allied undertaking in poor circumstances.

The Advisory Committee are of the opinion that with proper safeguards maintaining fair competition among all forms of transport, whether operated by the "combine" or otherwise, and with due publication and examination by the traffic authority of the returns and receipts of each constituent of the "pool," the interests of the public need not be prejudiced by such a financial arrangement as that approved by Parliament for the "combine."

At the present time the financial position of the London transport agencies is not one that will tempt either the general investor or the big financier. How therefore is this money to be provided? It could probably be provided to an increasing extent if the operating concerns were able to show a reasonable return on capital invested. But there are large traffic extensions necessary in the public interest which cannot hold out much hope of financial benefit to those who shoulder the responsibilities unless considerable assistance, either State or municipal, is afforded. It may therefore be necessary for the State or municipality to render a measure of assistance in the execution of transport schemes which are admittedly of great State or civic importance. A policy of this nature underlies section 17 of the Ministry of Transport Act, 1919. Such considerations must weigh with any traffic authority.

The position in regard to fares is complex. We do not suggest that the new traffic authority should have the power to fix or vary fares, for the obvious reason that these control the methods of operation, and any traffic authority claiming powers to settle the terms on which passengers are to be carried must be prepared to subsidise, or, in case of need, to operate. At the same time experience proves that some greater measure of control by the State is essential in the interests of the community. The principle of a fixed Parliamentary maximum charge, even if differential as applied to passenger transport undertakings, is sound, and when important variations are proposed which may affect it, the traffic authority should have the right and power to call for the production of all books and to require personal inspection of working methods before the responsible Minister recommends any proposals to Parliament for sanction.

Detailed examination by the Director-general, Finance Department, Ministry of Transport, of the figures relative to the working of the various undertakings of the "combine," indicates that under present conditions the capital invested in the various undertakings

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is not in all cases securing an adequate return to the investors, and that in future this may become even more obvious. For any typical future year even an actual loss on working expenses seems to be certain. There would also appear to be no prospect of further private capital on an adequate scale being attracted for effective working and development, unless economic fares are charged on all forms of transport. To what extent fares or any of them should be raised so as to become economic is a matter for close investigation, and we are of opinion that the most suitable method of reaching a definite conclusion is through the medium of the Private Bill Committee of the House of Commons, which, from the detailed statement furnished by the Ministry of Transport, should be able to settle—

(1) The present value of the share capital on which a reasonable rate of remuneration should be paid.
(2) The rate of remuneration which can be considered as reasonable.
(3) The percentage of increase in fares necessary to place the undertakings on a sound working basis.

THE LONDON TRAFFIC AUTHORITY.

The Advisory Committee are in complete agreement that the traffic authority must be a permanent statutory body responsible to the Minister of Transport. The grave condition of London traffic renders it essential for the Advisory Committee to recommend a traffic authority which shall inspire confidence that remedies will be applied effectively and expeditiously. We therefore recommend that a permanent statutory authority should be set up under the Minister of Transport; its membership to be restricted. We suggest that three members should be appointed, whose services and record would command public confidence, and that they should be selected by the Government on the assumption that their experience would enable them individually to specialise in the differing aspects of the traffic problem. If men of suitable standing are to be attracted it is obvious that their salaries must be higher than those ordinarily paid in the civil service. We suggest that they should be, say, £4,000 per annum for the chairman, and £3,000 each for the other two Commissioners.

The traffic authority should operate by powers delegated to it under Act of Parliament by the Minister of Transport, and in order that these may be adequate we hope that Parliament will consent to grant the Minister essential additional powers. The Minister of Transport would be able to veto any scheme, plan, or recommendation of the traffic authority. The presentation to Parliament, however, of periodic reports of the work and recommendations of the traffic authority would ensure publicity and enable criticism to be applied to any exercise of the veto regarding which there might be differences of opinion.

Nor do the Advisory Committee think that there should be any adverse opinion on the question of powers. These represent mainly the concentration in the hands of one authority of powers already vested in the several departments of State. With minor exceptions they leave unchanged the powers of local authorities. If an instance is wanted the abolition of the veto of local authorities under standing order No. 22 may be quoted. The veto of local authorities has been condemned by every body set up to investigate traffic conditions, and we recommend that it be abolished, so far as the Greater London area is concerned, since the establishment of the traffic authority with full powers and responsibilities will ensure that all proposals for tramways and tramway extensions are thoroughly investigated and considered. For the creation of this traffic authority legislation will, of course, be needed.

We suggest that the area over which the powers of the traffic authority would operate should be that within the existing Metropolitan and City Police boundaries.

The constitution of the London traffic authority which the Committee unanimously submit is as follows—

CONSTITUTION, DUTIES AND POWERS OF THE LONDON TRAFFIC AUTHORITY.

(1) *Constitution.*—The London traffic authority shall inquire into all questions relating to traffic in the existing Metropolitan and City Police areas or any extension thereof, and shall, amongst other matters, deal with the following—

(1) The preliminary examination of all Bills affecting the means of locomotion and transport in the London area.
(2) The making of necessary surveys and the preparation of schemes for the improvement of London traffic facilities, and the submission of such projects to the competent executive authorities.
(3) The study of all town planning and housing schemes on traffic grounds.
(4) The preparation of an authoritative general development plan to which all new London transit schemes should conform.
(5) The co-ordination in the public interest of all passenger transport agencies.
(6) The selection and prescription of routes to be followed by all or any forms and classes of traffic.
(7) The fixing of building or frontage lines on roads.
(8) The application of remedies in respect of all factors impeding street locomotion.
(9) Scientific research work in relation to the problems of transport and traffic.
(10) The right to initiate or oppose traffic legislation, regulations and bye-laws, and to deal with the revision, simplification, codification, and extension of traffic legislation, regulations, and bye-laws; the confirmation of all new traffic bye-laws and the fixing of speed limits within the area.
(11) In cases where agreement cannot be arrived at by the various authorities interested in regard to the apportionment of the cost of improvement schemes or projects traversing or affecting several areas, the traffic authority shall act as arbitrator.
(12) The approval of all designs for road vehicles used for the transport of passengers and any alterations thereto.

2.—*Membership.*—The Government shall appoint all members both initially and to fill vacancies. These appointments to be for whole-time service on an "established" basis and at fixed rates of pay.

3.—*Procedure.*—The London traffic authority shall make its own rules as to procedure, etc., and shall have all the necessary powers to require the attendance of witnesses, to examine them on oath, to sit in public, and to require information and documents to be furnished.

4.—*Powers.*—The London traffic authority shall act by virtue of the powers contained in the Act by which it is constituted. The authority will exercise such other powers as may by Order in Council be transferred to the Minister of Transport to be delegated by him to the authority. The London traffic authority shall have power to carry out, if requested to do so by the Minister, any of the purposes set forth in Section 17, Sub-section 1, of the Ministry of Transport Act, 1919, and shall be deemed an authority within the meaning of that section.

5.—*Power to Appoint Officers and Employ Experts.*—The London traffic authority shall have power to appoint such officers and servants as it may determine; to appoint committees, and to consult with and employ experts and pay their fees. The expenses of the London traffic authority shall be paid out of moneys provided by Parliament and included in the estimates of the Ministry of Transport.

6.—*Reports.*—The London traffic authority shall furnish regular reports, approximately every three months, of their proceedings and decisions. The Minister of Transport shall consider all such reports, and communicate to the traffic authority such observations as he may deem advisable. These reports shall be presented to Parliament.

There are voluminous appendices to the report, including an alternative scheme for the constitution of the traffic authority favoured by some members of the Technical Committee.

UNDERGROUND RAILWAY EFFICIENCY MEETINGS.

The sixth and final meeting of the fifth series of efficiency meetings of the Operating Department of the London Underground Railways and the London General Omnibus Company, was held on March 25, at the L.G.O.C. Training School, Milmans Street, Chelsea, Mr. H. E. Blain, operating manager, presiding over an attendance of 300 members of the administrative and control staffs of the Allied Companies. The papers on "Impressions of the Organisation," were read by Mr. L. Ivey, L.G.O.C.; Mr. D. L. Macassey, L.G.O.C.; Mr. A. Webb, Railways; Mr. H. Winkworth, Railways.

On this occasion the papers were read by cadets in the service, a grade which has been recently introduced. The papers were well received and the chairman, in his subsequent remarks, paid a tribute to the powers of observation shown by each of the readers, especially having regard to the short time they have been associated with the undertakings.

London County Council Highways Committee is now constituted as follows:—W. J. Squires (chairman), Major Philip Dawson, Messrs: J. M. Gatti, H. J. A. Glanville, H. H. Gordon, J. H. Harley, D. Hazel, G. H. Hume, A. C. H. Kinnard, S. March, Lt.-Colonel E. W. Morrison-Bell, A. Cooper-Rawson, A. H. Scott, J. Speakman, R. G. Taylor, Henry Ward and Brig.-Gen. W. W. Warner. One seat remains to be filled.

Projected Tube Railways for Marseilles.—M. Mognier, of the Marseilles Tramways Company, when speaking at Brussels recently outlined the proposals now under consideration for the construction of underground railways in Marseilles. He pointed out the necessity for co-operation with the tramways, and advocated joint management. The proposals include the construction of two lines in the form of a cross, intersecting at a point between the Hotel des Postes and the Palais de la Bourse. With this plan the congestion at the main business centres would be greatly relieved, and more people encouraged to move out to the suburbs. The scheme will require the construction of 4·32 miles of track below the surface and 3·12 miles at ground level.

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TRAMWAY EMPLOYEES' DEMANDS.

PROCEEDINGS OF THE NATIONAL COUNCIL.

In our issue of March 18 it was reported that the Ministry of Transport had promised an immediate inquiry into the conditions of the tramway industry. This was the result of a deputation, representing both the employers' and the employees' sides of the National Joint Industrial Council for the tramway industry, which was received by Sir George Beharrell and Sir W. Marwood, of the Ministry of Transport, on March 12. At that time the position was one of much difficulty. The men demanded an increase of 10s. per week for employees above 18, and 5s. for those below that age. This would bring the wages of adults up to 44s. above pre-war wages. The presentation of the case for the men had convinced the employers' side of the Council that some advance was necessary, but under existing restrictions on maximum fares they felt it to be impossible to agree to an increase in wages that was acceptable to the employees' representatives. Both sides of the Council were thus at the limit of negotiation unless the Government would undertake such legislation as would enable tramway owners to meet the obligations that would be imposed upon them by further concessions to the employees.

Convincing the Ministry of Transport.

The Ministry of Transport at once gave careful consideration to the matter. The report drawn up by Mr. J. Beckett, general secretary of the Municipal Tramways Association (given in another column), and statements submitted on behalf of the tramway companies, were subjected to an immediate critical investigation, and the Minister of Transport was able to satisfy himself that the situation required new legislation. He accordingly received a deputation on Monday, March 22.

The proceedings were private, and a degree of secrecy that appears wholly unnecessary was at the time maintained with regard to them. Some days afterwards, however, a brief account of what took place was published. Representatives of the Council laid before the Minister the difficulties of tramway undertakings, generally due to increased wages and cost of material, and their inability as a whole to afford the increase in wages for which the Council agreed a case had been made. Sir Eric Geddes said that it appeared clear to him the tramways as a whole could not live at the present cost of working on present revenue, though the results in the case of individual undertakings were so divergent that an investigation by accountants would be necessary in each case, and the matter could not be dealt with merely by giving power to increase maximum fares all round by a given percentage, nor could legislation by masses of private Bills meet the case on account of urgency. As regards increased wages, he pointed out that in other industries the law of demand and supply would affect the decisions at which an Industrial Council might arrive, as they would have before them the cost of production of the article, the effect of foreign competition, etc., but tramways were mostly free from competition, and he therefore thought that the Minister of Labour should be satisfied through some suitable tribunal that an increase, even though agreed upon by the Council, was reasonable. He therefore proposed—

(*a*) To seek authority of the Cabinet to introduce a Bill to enable him through the appropriate machinery to fix maximum fares where a case could be made out to meet increased operating costs, such fares to remain in force during the two years for which the temporary powers of the Ministry were operative and for eighteen months afterwards.

(*b*) To ask the Minister of Labour to communicate with the Council as to the steps to be taken to satisfy him that the increase in wages was reasonable.

Another Impasse—The Strike Notice.

The impasse between the two sides of the National Council was thus removed, and the following day the Council met again and endeavoured to arrive at a settlement. Discussion was continued with brief intervals from 10 a.m. to 6 p.m. On Wednesday, Thursday, and Friday the Council continued negotiations, the two sides conferring separately at intervals. All these proceedings were carried on privately, but when the Council adjourned on Friday some progress had been made toward a settlement, and another meeting had been arranged for Tuesday, when it was hoped that it might be possible to reach an agreement without reference to arbitration, to which it was understood the employees' representatives were unwilling to resort.

The delay in effecting a settlement had in the meantime created much dissatisfaction among employees, and considerable pressure was being put upon their representatives to take more urgent action. No surprise was caused, therefore, when on Saturday, without notice to the Council, strike notices signed by Mr. R. Williams and Mr. H. Gosling were telegraphed to the local secretaries. These notices were timed to expire at midnight on Saturday, April 3, so that a stoppage of tramway and omnibus services would take place throughout the country during Easter Sunday and Monday. This action was decided upon at a meeting of the United Vehicle Workers, when the following resolution was passed—

"The National Transport Workers' Federation is requested to advise and instruct the unions concerned to tender seven days' notice as and from Saturday, March 27, to expire at midnight, Saturday, April 3. This notice to cease work to be submitted on account of the failure of the workers' side of the Joint Industrial Council to induce the Council to grant 44s. per week increase upon pre-war rates asked for in the Federation's application."

An official of the Federation explained subsequently that "the strike order was not necessarily final, and resolved itself into a powerful effort to force the hands of the employers."

On Monday, March 29, the public had become aware of the danger of a stoppage of tramway services, and members of Parliament were informally discussing the situation. As the matter was now urgent Mr. Grant, by private notice, asked the Minister of Transport "whether the Government would be able to authorise such an increase of fares as would enable the proprietors to meet the workers' demands ?"

Sir Eric Geddes, in replying, said—"I only received notice of this question during question time on the bench, but I will answer it as well as I can. I am aware that a strike has been threatened by the transport workers during the Easter vacation. I am also aware that the tramway proprietors, both public authorities and companies, claim, and I believe the claim can be substantiated, that they are unable to continue operating at the present cost on the present authorised revenue. The Government has at present no authority from Parliament to increase the charging powers of the undertakings owned by public authorities to an extent which will be adequate to meet this claim. There is power under the Ministry of Transport Act to raise charges *inter alia* beyond the statutory charges in the case of company-owned undertakings (but it is obviously impossible to meet the situation by increasing the company-owned charging powers and not increasing the public authority-owned tramway powers), so that notice is being given to-morrow to introduce a Bill which will deal with the matter. As to when effect can be given to it, that will depend when we get power to deal with it in the House."

Government Promise as Guarantee to Bankers.

In reply to Mr. Billing, who asked whether the Minister had an undertaking that pending the introduction of the Bill there would be no strike, Sir E. Geddes said—"I have no such undertaking, but in the belief that the House will pass an adequate measure, I hope the authorities and the companies may be able, through bankers or otherwise, to obtain sufficient funds to meet the men's demands in so far as they are found to be reasonable by the appropriate machinery. As for getting an undertaking, I propose to introduce the measure and then to endeavour to arrange with the men on the one side and the employers on the other to see that the matter shall be dealt with in a reasonable way."

In these circumstances the National Joint Council resumed negotiations on Tuesday, March 30, under somewhat extraordinary conditions. The employers were, on the one hand, confronted with a threatened strike at the end of the week, and on the other with an intimation that the Government considered it quite a proper proceeding in case their cash resources were insufficient to meet the demands of the men that they should apply to their bankers for the necessary funds, relying on the concessions to be provided by the promised Bill to place them in a position to repay such advances.

During the day a visit was received by the National Council from Sir David Shackleton, representing the Ministry of Labour, who urged the desirability of a settlement. This feeling was shared by both sides of the Council, but the employers, conscious of the limitations of tramway earning power, pleaded that they could not go beyond an offer of 4s. per week. This the employees' side declined to accept, but negotiations were not broken off, and by mutual consent the Council adjourned at 10.30 p.m. until Wednesday, March 31. Early in the afternoon of that day Sir Eric Geddes introduced in the House of Commons without further explanation the promised Bill, the full text of which is given in another column. Stated briefly, it gives power to the Ministry of Transport to enable tramway undertakings to increase their charges to such an extent as may be necessary—

(*a*) In the case of municipal undertakings to such a point as will enable them to pay their way, but without making a profit.

(*b*) As to commercial undertakings, to enable them to pay all priority charges, and a reasonable return on capital.

Power is taken for the Minister to make interim orders which will be available for a limited period, but orders for a more extended period are only to be made after the matter has been referred to an advisory committee, which it is intended to set up for the purpose.

Sir Eric Geddes announced that the Government would proceed with the second reading of the Bill immediately after the House resumed after the Easter recess.

The Two Sides Reach an Agreement.

In the meantime the National Council continued its efforts to reach a mutually acceptable compromise, and on the Wednesday afternoon the members were able to congratulate one another on

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the successful termination of their long-drawn-out negotiations. The employers had increased their last offer to 5s. per week to be paid as from March 29, with 1s. per week in addition as from June 1, and the employees' representatives, after the fullest considerations of the conditions of the industry, had agreed to accept this offer.

The agreement was embodied in the following resolutions—

"That a general increase of 5s. per week in the bonus now being paid to all employees of 18 years of age and upwards (for whom application is made) be granted, to take effect from and including March 29, 1920, with a further increase of an additional shilling per week to take effect from and including June 1, 1920. In the case of any tramways or light railways undertaking putting forward a claim (not later than Thurdsay, April 22, 1920) to the effect that there are special circumstances in their case which entitle them to exemption from the payment of such increases, such undertaking shall be entitled to place its case before this Council which shall investigate the claim and determine whether or not the claim is justified.

"If in any case submitted for consideration the Council is unable to arrive at a conclusion in accordance with the constitution, relating to voting, the matter shall be referred to an arbitrator by the appropriate Ministry.

"With regard to employees under 18 years of age the additions to the bonus now being paid shall be one half of the above named increases."

Strike notices were at once cancelled and the Council adjourned with mutual assurances from the two sides that the terms of the agreement would be loyally carried out.

Unauthorised Strikes—Attitude of the Employers.

Since then there have been strikes in Manchester, Salford, Oldham, Huddersfield, and Cardiff, and much telegraphic correspondence has taken place between Mr. Beckett for the municipalities, and Mr. Hirst and Mr. Cliff for the employees.

This eventuated in a general manifesto by Mr. Beckett, on behalf of the municipalities.

A request was made by Mr. Hirst and Mr. Cliff, on behalf of the employees' side of the Council, that a special meeting of the National Council should be called. Mr. J. Beckett, general secretary of the Municipal Tramways Association, at once obtained the views of the employer members of the National Council and found that the general opinion was that unless there were some new factors in the position which had not received the consideration of the Council, it was undesirable to hold such a meeting until the employees on strike at Manchester, Salford, Oldham, Huddersfield, and Cardiff returned to work. Mr. Cliff was unable to give a guarantee that the men on strike would resume work if a meeting of the National Council was called, and he stated that Mr. Hirst was calling a national conference of employees on April 9.

A letter was then sent by Mr. Beckett to Mr. Hirst recapitulating the history of the recent negotiations, the letter concluding as follows—

"Every local authority and every company representative on the National Council is prepared to give effect to the decision of their representatives, whilst, on the side of the employees, in five instances out of ninety municipal undertakings the men decline to carry out the decision of their own representatives. The same remark is true in the case of one company out of fifty. It is in these circumstances that you request that I should convene at once a special meeting of the National Council to consider the question.

"Throughout the discussion of the subject by the National Council the assurance was frequently given that not a single representative on the employers' side was out to depress wages, and I think you will agree that not a single feature of the interests of either the employers or employed escaped the fullest consideration during the lengthy conference that took place. I am directed to say that my members deplore and deprecate the enormous inconvenience caused to the travelling public in some districts by the irregular and unconstitutional action of some of your members. They are of opinion that unless there are some new factors bearing upon the financial position which did not receive consideration they do not see how any useful or effective purpose can be served by a special meeting of the National Council at this stage.

"The representatives of the municipalities upon the National Council take their stand upon the constitutional issue. To this primary consideration even the public convenience must be subordinated for the time being, otherwise compacts and agreements made after the fullest investigation by both sides will be continually reduced to mere scraps of paper, and the utility of Whitley Councils as instruments for securing industrial harmony will be not only impaired but destroyed. They will not be prepared to meet for further consideration of this subject unless and until those who are now on strike return to work. Upon this point they are rightly resolute, and are prepared to appeal for support to every section of the community upon it."

Decision of Employees' Conference in London.

The workers' side of the Industrial Council for the tramways industry met on April 9 at Transport House, Kensington, to consider the situation which had arisen out of the recent settlement and the sectional strikes at Manchester, Salford, Huddersfield, Oldham, Cardiff, and the area covered by the South Lancashire Tramways Company.

The conference went into the question of whether the sectional strikes should be recognised by the Unions and made national, or whether the employers' offer of the new negotiations on condition that the men return to work should be accepted.

The meeting of the workers' side of the Industrial Council was followed by a national delegate conference convened by the United Vehicle Workers' Union at the Central Hall, Westminster, when a resolution was carried, by 96 votes to 3, in favour of reopening negotiations, with the object of securing the 10s. increase if possible, but at least a minimum increase of 8s. a week, with a proviso that any settlement which gave less than 10s. a week should be submitted to a ballot of the Unions before final acceptance.

It was stated that the employers would be willing to put aside the agreement recently arrived at and to start negotiations afresh if the men immediately returned to work. As against the attitude assumed by representatives of the men on strike, namely that the larger centres could probably gain the full 10s. if left to themselves, the Executive of the Vehicle Workers' Union and the Transport Workers' Federation held firmly to the principle that a national settlement was the only means of securing an adequate wage for the smaller and less organised undertakings.

Mr. Hirst afterwards informed the reporters that the employers' side had agreed to the National Joint Industrial Council meeting in London on April 14 to reopen negotiations and discuss a fresh settlement, and that the delegate conference recommended the strikers to resume work, in which event they would receive strike pay.

An offer on the foregoing lines was made to the Manchester and other Lancashire strikers on the same day, but the leaders decided to await the decision of the London meeting before submitting it to a vote.

Another development on April 9 was an offer by the South Wales District Joint Industrial Council to increase the wage of workers over 18 years of age by 3s. per week from the first full pay day in March, the additional 1s. being merged in the 3s. This offer was rejected by the men on the same day. An effort at settlement has to be credited to Cardiff Tramways Committee, who on April 9 agreed to advise the Corporation to instruct their representatives on the Joint Industrial Council to advocate the payment of not less than the minimum paid to corporation labourers, conditionally on resumption of work on the following day.

Negotiations Re-opened.

April 13 arrived before a settlement was reached at Manchester and Salford on the lines, it is stated, of an advance in the employees' basic rate of wages. Under this arrangement the men expect an advance of 4s., which is looked upon as better than 5s. or 6s. per week as war bonus. At first the union coupled their acceptance with a proviso to tender 14 days' strike notice simultaneous with the return to work on the night of April 13, but when a Labour Councillor warned the extremists that the Tramways Committee would not discuss the question under a threat of that kind, the meeting rejected the proviso. At a special meeting of the City Council on the same day, it was decided to adjourn without discussing the strike for fear of prejudicing the negotiations, and the Lord Mayor was thanked for his tactful handling of the negotiations.

The Joint Industrial Council met in London on April 14, the basis for the re-opening of negotiations being a recommendation of the South Wales Industrial Council that a further 2s. should be added to the basic rates, making a total increase of 8s. The sitting was adjourned until the following day.

Bradford Corporation, on April 13, decided that the advance of 10s. asked for should come into immediate operation. An amendment to make the advance contingent on the approval of the Industrial Council was lost by 28 votes to 26.

Appointments Register of Automobile Engineers.—The register which is kept by the Institution of Automobile Engineers of the members who either wish to better their positions or who are actually out of employment now contains some 50 names. Most of the applicants have been fortunate enough to remain at their own work during the war, while those who have joined up have been able to keep in close touch with the automobile construction through the M.T., R.A.S.C. If manufacturers or transport companies will send full particulars of any positions they may have vacant, the Institution will be glad to send a list of men who appear to be capable of filling these positions. The positions sought for range from the junior who desires work in the experimental shop to the works manager; in fact, a man could be suggested for practically any position in the works or drawing office except that of junior draughtsman, where the demand far exceeds the supply. Men capable of running transport undertakings on the technical or commercial side are also on the list.

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NEW TRAMWAY LEGISLATION.

MAXIMUM CHARGES TO BE INCREASED.

In accordance with arrangements made with the National Joint Industrial Council for the tramway industry, Sir Eric Geddes, Minister of Transport, on March 30 presented to the House of Commons a Bill to make further provision for the temporary modification of the charges that may be made in respect of, and the obligations affecting, tramway undertakings. The Bill is prefaced by the following memorandum—

The Statutory Undertakings (Temporary Increase of Charges) Act, 1918, enables the appropriate Government department, by order, to authorise the increase of charges by statutory undertakings. The power, however, was limited—

(*a*) In the case of local authorities, the statutory maximum charges cannot be increased by more than 50 per cent.

(*b*) In the case of companies, they cannot be increased by more than the amount sufficient to enable the company to pay dividends on ordinary capital at a rate exceeding three-fourths of the pre-war rate of dividend.

In the case of tramway undertakings (including light railways constructed wholly or mainly on public roads) the change of circumstances has rendered these limitations unduly restrictive

The Bill proposes to modify the restrictions, but requires reference to an advisory committee of proposals for increasing the charges, with power, however, to the Minister of Transport in cases of urgency to make interim orders pending such reference.

The text of the Bill is appended.

TRAMWAYS (TEMPORARY INCREASE OF CHARGES) BILL.

A Bill to make further provision for the temporary modification of the charges which may be made in respect of and the obligations affecting tramway undertakings.

Be it enacted by the King's Most Excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows—

Amendment of S. 1 of 8 and 9 Geo. 5, c. 34, in its Application to Tramways.

1.—(1) The limitations contained in the proviso to sub-section (1) of section one of the Statutory Undertakings (Temporary Increase of Charges) Act, 1918 (hereinafter referred to as the Principal Act) shall not apply in the case of orders made after the passing of this Act by the Minister of Transport in relation to tramway undertakings, but in lieu thereof the following limitations shall apply—

(*a*) Where the undertakers are a local authority, no modification in the statutory provisions regulating the charges to be made by the undertakers shall be authorised which is more than sufficient, so far as can be estimated, to enable the undertaking to be carried on without loss; and

(*b*) In any other case, no such modification shall be authorised which is more than sufficient to provide, with due care and management, for interest on loan capital and for a reasonable return on share capital, regard being had to the pre-war financial condition of the company, and its prospective development.

(2) An order authorising any increase in the statutory maximum charges applicable to a tramway undertaking may attach such conditions thereto as the Minister may think proper, and may modify any statutory provisions, and the provisions of any agreement, whether or not confirmed by an Act or order having the force of an Act, which impose obligations on the undertakers as to the frequency of any tramway service.

(3) Before making an order in pursuance of the powers conferred by the principal Act as amended by this Act the Minister shall refer the matter to the advisory committee hereinafter constituted for their consideration and report—

Provided that if in the case of any tramway undertaking it appears to the Minister that there is ground for making an order and that the case is one of urgency, he may, without any such reference and without any such notices as are required by the principal Act, make an interim order increasing the statutory maximum charges by such amount, not exceeding 100 per cent., and subject to such conditions as he thinks proper; but an interim order shall not remain in force more than six months, and where any interim order is made the Minister shall forthwith refer the matter to the advisory committee.

(4) The charges authorised by any order made under the principal Act as amended by this Act may be charged notwithstanding any statutory provisions or any agreement whether or not confirmed by an Act or order having the force of an Act.

(5) If at any time it appears to the Minister of Transport that owing to changes in the cost of labour or materials or other circumstances affecting a tramway undertaking with respect to which an order has been made, the powers of charging effected by the order are insufficient or excessive for the purposes aforesaid, the Minister may, and if representations to that effect are made to him by the undertakers or by the local authority of any district served by the tramway, or in case where the local authority are the undertakers by twenty ratepayers in the district, he shall refer the matter to the advisory committee hereinafter constituted, and may after considering any report of the committee make an order revising the powers of charging so authorised as aforesaid; so, however, that revised maximum charges shall not in any case be less than the statutory maximum charges applicable to the undertaking.

Advisory Committee.

2.—(1) For the purpose of giving advice and assistance to the Minister of Transport with respect to the making of orders in relation to tramway undertakings and for safeguarding the interests of users of tramways, a committee shall be constituted consisting of the Light Railway Commissioners and such members of the panel set up under Section 23 of the Ministry of Transport Act, 1919, as the Ministry may appoint for the purpose, and such member as the Minister may appoint shall be chairman of the committee, and the committee, if so authorised by the Minister of Transport, may delegate to sub-committees thereof any of its powers and duties under this Act.

(2) The committee, before reporting or advising on any matters referred to them under this Act shall, unless in their discretion they consider it unnecessary or undesirable to do so, give such public notice as they think best adapted for informing persons affected of the date when and the place where they will inquire into the matter, and any person affected may make representations to the committee, and unless in their discretion the committee consider it unnecessary, shall be heard at such inquiry, and if the committee in their discretion think fit, the whole or any part of the proceedings at such inquiry may be open to the public—

Provided that for the purpose of this provision the Council of any city, borough, burgh, county, or district shall be deemed to be persons affected in any case where such council or any persons represented by them may be affected by any proposed order.

(3) The committee shall hear such witnesses and call for such documents and accounts as they think fit, and shall have power to take evidence on oath, and for that purpose any member of the committee may administer oaths.

Supplemental Provisions.

3.—(1) The Minister of Transport may for the purposes of this Act employ such accountants as he may think fit, and it shall be the duty of tramway undertakers to furnish to any such accountant such information and to produce to him such accounts and books as he may require for the purpose of reporting to the Minister or the advisory committee as to the financial position of the undertaking.

(2) The costs incurred in connection with any undertaking under this Act, including the remuneration of any such accountant, shall be paid by the undertakers, and the Minister of Transport may certify the amount of the costs incurred, and any sum so certified and directed by the Minister to be paid by the undertakers shall be a debt to the Crown from those undertakers.

(3) For determining the cost of labour for the purposes of this Act, the Minister of Labour shall, at the request of the Minister of Transport, certify what are the rates of wages which have been fixed either by the National Joint Industrial Council for the tramway industry or by any award under the Industrial Courts Act, 1919.

(4) For the purposes of this Act statutory maximum charges shall not include any charges authorised by an order under the principal Act or this Act.

Short Title, Construction and Duration.

4.—(1) This Act may be cited as the Tramways (Temporary Increase of Charges) Act, 1920, and shall be construed as one with the principal Act.

(2) Notwithstanding anything in the principal Act, that Act as amended by this Act shall, in relation to tramway undertakings, have effect until the 15th day of February 1923.

Workers' Conference.—The National Union of Tramway and Vehicle Workers will hold their annual conference in Nottingham in June. It is expected that 270 delegates will attend representing a total membership of over 120,000.

Royal Commission on Railways.—Sir Eric Geddes, replying for the Prime Minister to a question by Mr. Gilbert in the House of Commons, said that the Royal Commission on Railways suspended their sittings in January in 1915, without having issued any report, and in the present circumstances it was not intended to ask them to resume their sittings or to take further evidence.

Moscow Tramways Used Solely for Goods.—In an article descriptive of life in Russia, published in a London newspaper, the author states that at Moscow "the electric tramways are in operation, but not for the carriage of passengers. Moscow's municipality uses the cars, as well as thousands of sleighs, for the transport of fuel and other stores. For in this novel community the feeding and clothing of the people, as well as the illumination of their homes and institutions, is done by the State."

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MUNICIPAL TRAMWAY FINANCE.

SERIOUS POSITION OF MANY UNDERTAKINGS.

The following statement of the prospective position of municipal tramways in the United Kingdom for the year 1919-20 was prepared by Mr. J. Beckett, the general secretary of the Municipal Tramways Association, to assist the National Joint Industrial Council for the Tramway Industry in their consideration of the demands of the employees for an increase of ten shillings per week. The statement was subsequently submitted to Sir R. Horne, the Minister of Labour, and afterwards to the Minister of Transport, who satisfied himself after critical examination that it is substantially accurate.

Earnings per Car-mile.

The 66 returns show that the earnings per car-mile varied from 13·94d. in Croydon to 27·09d. in Oldham, 27·41d. in Birkenhead, 27·56d. in Bournemouth, and 30·2d. in Blackpool. Birkenhead shows the highest receipts per car-mile of any industrial town in the Kingdom, while Oldham is in the second place, earning one-third of a penny less.

The following is a classification of the 66 authorities, viz.—

Earnings per Car-mile.	Number of Authorities.	
Between 13 and 14 pence	1	
,, 15 ,, 16 ,, ...	5	47, or 71·2 per cent.
,, 17 ,, 18 ,, ...	6	
,, 18 ,, 19 ,, ...	8	
,, 19 ,, 20 ,, ...	10	
,, 20 ,, 21 ,, ...	9	
,, 21 ,, 22 ,, ...	8	
,, 22 ,, 23 ,, ...	6	
,, 23 ,, 24 ,, ...	5	
,, 24 ,, 25 ,, ...	2	
,, 25 ,, 26 ,, ...	1	
,, 26 ,, 27 ,, ...	1	
,, 27 ,, 28 ,, ...	3	
,, 30 ,, 31 ,, ...	1	
Total	66	

Overcrowding is common and constant in most undertakings at certain times of the day and at week-ends. The increase in the number of passengers carried per car-mile between 1913 and 1919 is very marked.

Finances, 1918-19.

The returns of the financial results of the last completed year 1918-19—quite apart from any question of rate-aid from tramways, or any provision for renewals, are shown in the following table. Side by side with these results are shown (1) the approximate car mileage for the current year, and (2) the amount which would be required to be set aside in the renewals fund at the rate of 1d. per car-mile.

Losses.

Authority.	Amount of Loss.	Approximate Car Mileage, 1919-20.	Amount required for Renewals at 1d. per Car-mile.
	£		£
1. Bexley Heath ...	303	1,000,000	4,166
2. Burton-on-Trent ...	386	343,000	1,429
3. Colne	3,139	240,000	1,000
4. East Ham	11,424	1,395,000	5,812
5. Gloucester	2,423	466,000	1,942
6. Lowestoft	1,433	272,000	1,133
7. Stalybridge, etc., Bd.	362	1,242,000	5,175
8. Yarmouth	2,909	538,000	2,242
9. York	1,290	905,000	3,771
	£23,669	6,401,000	£26,670

Profits.—Amount of Free Balance.

Authority.	Amount of Profit.	Approximate Car Mileage, 1919-20.	Amount required for Renewals at 1d. per Car-mile.
	£		£
1. Aberdare	2,598	480,000	2,000
2. Accrington	2,482	583,000	2,429
3. Ashton-under-Lyne	11,393	498,000	2,075
4. Birkenhead	16,500	1,275,000	5,313
5. Birmingham ...	171,445	15,121,000	63,004
6. Blackburn	6,650	1,274,000	5,308
7. Blackpool	30,052	2,166,000	9,025
8. Bolton	41,421	2,862,000	11,925
9. Bournemouth ...	29,599	1,680,000	7,000
10. Bradford	60,819	5,636,000	23,483
11. Brighton	5,093	1,500,000	6,250
12. Bury	8,278	1,520,000	6,333
13. Cardiff	52,518	2,750,000	11,458
14. Chester	4,468	278,000	1,158
15. Chesterfield	417	277,000	1,154
16. Coventry	4,159	1,068,000	4,450
17. Croydon	12,554	2,770,000	11,542
18. Darlington	2,351	430,000	1,792
19. Derby	13,173	1,194,000	4,975
20. Dundee	10,454	1,641,000	6,838
21. Erith	3,703	415,000	1,729
22. Exeter	878	431,000	1,796
23. Halifax	10,767	2,200,000	9,167
24. Huddersfield... ...	22,231	2,770,000	11,542
25. Hull	1,600	4,743,000	19,763
26. Ipswich	2,295	667,000	2,779
27. Keighley	215	234,000	975
28. Leeds	144,230	9,880,000	41,167
29. Leicester	9,460	4,100,000	17,083
30. Leith	9,626	1,081,000	4,504
31. Liverpool	75,484	13,500,000	56,250
32. London C.C. ...	8,069	56,000,000	233,333
33. Manchester	222,488	20,000,000	83,333
34. Nelson	664	175,000	729
35. Newport (Mon.) ...	5,666	1,094,000	4,558
36. Newcastle-on-Tyne ...	45,000	6,020,000	25,083
37. Nottingham	63,639	4,100,000	17,083
38. Oldham	19,230	2,114,000	8,808
39. Plymouth	10,679	838,000	3,492
40. Portsmouth	21,010	2,896,000	12,067
41. Preston	8,290	1,160,000	4,833
42. Rawtenstall	687	610,000	2,542
43. Reading	5,062	881,000	3,671
44. Rochdale	662	1,850,000	7,708
45. Rotherham	2,797	964,000	4,017
46. Salford	42,672	6,000,000	25,000
47. Sheffield	48,722	10,265,000	42,771
48. Southampton ...	20,795	2,100,000	8,750
49. Southport	3,658	843,000	3,513
50. Sunderland	14,865	1,595,000	6,646
51. Swindon	497	204,000	850
52. Wallasey	13,021	1,471,000	6,129
53. Walsall	8,450	903,000	3,763
54. West Ham	7,739	3,138,000	13,075
55. West Hartlepool ...	8,646	501,000	2,088
56. Wigan	11,860	1,600,000	6,667
57. Wolverhampton ...	19,372	1,312,000	5,467
Totals ...	£1,381,153	213,658,000	£890,243

These results may be summarised as follows—

57 Authorities show a profit, without any provision for renewals of		£1,381,153
Whilst 9 Authorities show a loss of... ...		23,669
Leaving a net profit for 66 Authorities of ...		£1,357,484
At the low rate of 1d. per car-mile for renewals, it is necessary to set aside the following sums, as shown above, viz.	£890,243	
	26,670	916,913
Leaving a margin of		£440,571

which represents a further sum of ·48d. per car-mile.

The aggregate amount available for renewals over the whole of these 66 undertakings, for the last financial year was therefore 1·48d. per car-mile, apart from any question of rate-aid.

Tramways Budget, 1920-21.

The returns that have been received relating to the finances for the ensuing year are practically the tramways budgets for 1920-21. In almost every case they are based upon the actual average earnings per car-mile during the completed five-sixths of the current financial year for revenue purposes, and for expenditure purposes upon the approximate cost of operating the tramways during January last. They assume that the present high rates of earnings will be maintained on the one hand, and on the other they do not take account of (1) any further increases in wages, or (2) in the cost of power, or (3) in any of the commodities used in the industry, or (4) of any increased charges in general which will be necessary in order to reduce the overcrowding of cars. They must therefore be described as optimistic.

The sums included in them for renewals (as they have been submitted) vary widely—from nothing in 18 cases to 6d. per car mile in Chester, and 7·42d. per car-mile in Rawtenstall. For the purpose of the return I have assumed that prior to the war a sum of round about 1d. per car-mile was required to make provision for renewals, and in order to establish a correct analogy between each authority, I have deleted from the returns the amounts actually inserted for this purpose, and substituted a common figure of 2½d. per car-mile in every case.

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It will be observed that only 12 authorities will be capable of surviving this test during next year; all the rest show losses.

They may be summarised as follows—

The aggregate amount of the losses will be	£2,212,100
Less the aggregate profits	48,513
Leaving a net loss for all undertakings of ...	2,143,587

The table also shows, for convenience of comparison, the sum of 1d. per car-mile for each undertaking.

The cases in which the maximum fares are now being charged are indicated thus—M = maximum fares for ordinary and workmen; M.O. = maximum fares for ordinary passengers only; M.W. = maximum fares for workmen only.

PROFITS.

	1d. per Car-mile Equals		£	
1	2,075	Ashton-under-Lyne	723	
2	5,313	Birkenhead	2,435	
3	9,025	Blackpool	26,035	
4	11,925	Bolton	7,773	M.W.
5	7,000	Bournemouth	11,678	M.
6	11,458	Cardiff	11,118	M.
7	1,158	Chester	449	M.
8	975	Keighley	49	M.
9	4,558	Newport...	411	
10	8,808	Oldham	5,625	M.W.
11	6,646	Sunderland	532	
12	6,129	Wallasey...	1,685	M.
		Total	£68,513	

LOSSES.

1	2,000	Aberdare	8,200	M
2	2,429	Accrington	9,205	M
3	4,166	Bexley	24,998	
4	63,004	Birmingham	99,083	M.
5	5,308	Blackburn	18,460	
6	23,483	Bradford	47,610	M.W.
7	6,250	Brighton	70,625	M.
8	1,429	Burton-on-Trent	7,104	
9	6,333	Bury	7,753	M.
10	1,154	Chesterfield	2,885	
11	1,000	Colne	3,322	M.
12	4,450	Coventry	19,402	M.
13	11,542	Croydon	43,904	
14	1,792	Darlington	4,324	M.W.
15	4,975	Derby	6,003	
16	6,838	Dundee...	11,419	
17	5,812	East Ham	55,083	
18	1,729	Erith	12,554	M.
19	1,796	Exeter	4,727	M.
20	1,942	Gloucester	12,109	M.O.
21	9,167	Halifax	36,942	M.
22	11,542	Huddersfield	2,242	M.W.
23	19,763	Hull	51,477	M.W.
24	2,779	Ipswich	9,423	M.
25	41,167	Leeds	6,687	
26	17,083	Leicester	98,400	
27	4,504	Leith	8,144	M.
28	56,250	Liverpool	88,031	
29	233,333	London County Council ...	963,633	M.W.
30	1,133	Lowestoft	5,013	
31	53,333	Manchester	64,997	M.W.
32	729	Nelson	1,539	M.W.
33	25,083	Newcastle-on-Tyne	96,320	
34	17,083	Nottingham	2,526	
35	3,492	Plymouth	26,375	M.W.
36	12,067	Portsmouth	34,868	
37	4,833	Preston...	6,178	M.W.
38	2,542	Rawtenstall	14,491	M.
39	3,671	Reading	10,885	M.
40	7,708	Rochdale	19,503	M.
41	4,017	Rotherham	7,718	M.
42	25,000	Salford	18,218	M.W.
43	42,771	Sheffield	22,758	
44	8,750	Southampton	17,875	M.
45	3,513	Southport	842	M.W.
46	5,175	Stalybridge, etc., Bd.... ...	21,960	M.
47	850	Swindon	2,503	M.
48	3,763	Walsall	11,207	
49	13,075	West Ham	40,678	M.W.
50	2,088	West Hartlepool	7,992	
51	6,667	Wigan	6,663	
52	5,467	Wolverhampton	18,554	M.W.
53	2,242	Yarmouth	5,518	
54	3,771	York	13,169	M.
		Total	£2,212,100	

REPAIRS AND MAINTENANCE.

The charge in the estimates for 1920-21 which shows the greatest variety is that for repairs and maintenance. It ranges from 2·04d. at York to 15·42d. at Brighton, but in the latter case "all renewals are paid for out of revenue before showing a profit."

	Per car-mile.		Per Car-mile
York	2·04d.	Blackburn	2·63d
Salford	2·19d.	Rawtonstall	7·38d.
Portsmouth	2·23d.	Bradford	8·40d.
Leith	2·47d.	Brighton	15.42d.

The 66 undertakings may be classified as follows—

Per Car-mile.		Per Car-mile.	
Between 2d. and 3d. ...	9	Between 7d. and 8d. ...	1
,, 3d. ,, 4d. ...	22	,, 8d. ,, 9d. ...	1
,, 4d. ,, 5d. ...	16	,, 15d. ,, 16d. ...	1
,, 5d. ,, 6d. ...	10	No details given	2
,, 6d. ,, 7d. ...	4		
	57		66

These figures amount to an effective commentary upon the magnitude of deferred repairs in consequence of the war.

GENERAL.

Some of the undertakings cannot carry on at present without considerable rate aid, and any additional burden cast upon them will raise in an acute form the question of whether or not such undertakings must be abandoned. There can be no doubt whatever about the truth of this statement. In quite a number of instances the loss during 1920-21, which under present circumstances must be borne (if reasonable provision is made for renewals) represents from about 20 per cent. to 25 per cent. of the total revenue of the undertakings, and any additional charge will increase this ratio. Included in this category are—

Bexley Heath	Gloucester	Rawtenstall
Blackburn	Halifax	Stalybridge, etc., Joint Board
Burton-on-Trent	Ipswich	St. Helens
Colne	Leicester	West Hartlepool
Coventry	London County Ccl.	Wolverhampton
Croydon	Lowestoft	York
East Ham	Newcastle-on-Tyne	
Erith	Portsmouth	

The calculated cost of the application made by the employees for an increase in wages of ten shillings per week would amount in the case of the 66 authorities to £1,186,494 per annum.

GLASGOW TRAMWAY PROBLEMS.

Mr. James Dalrymple, general manager of the Glasgow Corporation Tramways, in a lecture at the Glasgow Athenæum on March 17, entitled "Tramway Problems," gave an interesting account of the remarkably successful history of the undertaking and of the difficulties that at present confront it. Ever since the Corporation took over the tramway system the department had, he said, nothing to record but steady and continuous progress. Beginning with a weekly revenue of £3,800 the receipts had steadily grown until they now averaged about £33,000. During the first twelve months' working 60,000,000 passengers were carried and for the current year, which ends on May 31 next, the number was likely to exceed 500,000,000. No tramway undertaking of a similar size anywhere could touch these figures, and the result had been achieved by giving a regular and frequent service of cars which were made as clean and attractive as possible at the lowest possible fare. Another important feature was the arrangement of routes under which nearly all the cars passed through the centre of the city.

The capital expenditure from first to last had been roughly £4,000,000, and that sum had been entirely wiped out from revenue so that there was now no interest to pay and no sinking fund to meet. The undertaking was absolutely free from debt and stood as an unburdened property of the citizens of Glasgow. Up to date the department had contributed as free revenue to the common good the sum of £1,000,000, and the citizens should be profoundly thankful that the former members of the tramway committee and the Corporation showed such wisdom and foresight in the management of the financial policy of the tramways department.

Mr. Dalrymple took it for granted that the citizens generally were of opinion that the tramways should be self-supporting. For the current year every month showed a large deficit and from June 1 to the end of January last the total deficiency amounted to about £50,000. This resulted in spite of the fact that the traffic revenue had been the largest on record. The wages bill for 1913-14 was just over £400,000; in the current year it would reach £1,100,000.

Congestion of traffic had become very great, and he considered that the only way to overcome it was to spread out the central arteries of traffic and to erect one or two bridges near the centre. The department would shortly be faced with a huge capital expenditure, not only in the endeavour to do away with the congestion in the central portions but for extensions outward from the city, for which powers had already been obtained. No capital could be expended on these schemes, however, until the undertaking was put on a sound financial basis, and this could only be done by an increase in fares.

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LONDON ELECTRIC RAILWAY FARES.

A Compromise Reached.

In the House of Commons on March 25 the second reading of the London Electric Railway Companies (Fares, etc.) Bill was carried after an explanation had been given as to an agreement reached between the London Members of Parliament and the promoters of the Bill.

Mr. Bowerman moved the rejection of the Bill, and said that they had to consider the vast army of workpeople who had to travel daily by what was known as workmen's trains. The railway companies had encouraged them to live some distance away from their work, and now the companies were asking authority to stop the practice.

Sir E. Wild seconded the motion.

The Government View.

Sir Eric Geddes (Minister of Transport) said he would state the Government position. The difficulty about the wages of the men on these undertakings was that it was impossible to separate the Metropolitan District Railway, which was controlled by Government and to which the settlement as to wages made for the rest of the railways of the country applied, from the tube railways, which were worked under the same general management and to which the settlement did not apply. The combine of the companies was authorised by an Act in 1915, but that in no way limited the statutory obligations of the various companies. The combination was brought about because some of the companies were not paying and at that time the omnibuses were the prosperous part of the combine. A good deal had been said about how people who lived some distance from their work would be affected if the increased fares were granted. As a matter of fact the promoters of the Bill had powers which would enable them to raise a very considerable revenue on the long-distance passengers. That, however, would be a suicidal policy which would congest London. It was, in fact, for the short distances that additional powers were required.

The Position of Tramways.

It was a very significant thing that only on March 22 he received a deputation from the Whitley Council connected with the tramway undertakings, and they agreed that increased wages were necessary for the men, but that it was impossible to pay the increased wages unless the charges were raised. It was not only tramway companies that would have to raise their charges, but municipalities as well. He had to agree that he would recommend the Cabinet that it was indispensable at the earliest possible date to meet the just demands of the men, and that the Government should introduce emergency legislation to enable the charges of municipal undertakings to be put up. That would have to be done at a very early date, otherwise there would be no municipal tramways running in the country. The Whitley Council had agreed that it was essential that the men should have more money, and so the Government had to give that undertaking. It was no use expecting a prosperous transport undertaking unless it was given a reasonable living wage and enabled to raise capital.

Underground Railway Finance.

As a result of investigations carried on by his department, it was found that the estimated profit of the four railways in the combine was £836,000 a year, but if they added the omnibuses there was a loss over all of £177,000. That was without charging interest. If they added the prior charges on the five undertakings they got a loss of £1,016,000, making a total loss of £1,194,000. That was without giving the ordinary stock any interest at all. If they added 4 per cent. on the ordinary stock they got a gross loss of £1,900,000. If the existing powers of charging were fully exercised, and if the omnibus fares were put up correspondingly, they could raise an additional £700,000 against the loss of £1,194,000. The report of the Committee on London Traffic contained the following—

"To what extent fares or any of them should be raised so as to become economic is a matter for close investigation, and we are of opinion that the most suitable method of reaching a definite conclusion is through the medium of a Private Bill Committee of the House of Commons, which from the detailed statement furnished by the Minister of Transport, should be able to settle—

"(1) The present value of the share capital on which a reasonable rate of remuneration should be paid;

"(2) The rate of remuneration which can be considered reasonable;

"(3) The percentage of increase in fares necessary to place the undertaking on a sound working basis."

That expressed very clearly the attitude of the Government on the Bill. It was absolutely beyond dispute that if this undertaking were to go on serving the public at the present day cost they were entitled to an inquiry as to whether they could go on financially as a healthy concern. It would have been possible to have taken possession of these railway undertakings under the Ministry of Transport Act and to have authorised the increase of the fares. That would have involved considering those questions which had been stated by the Committee on London Traffic. It was a very difficult thing to ask any one Minister to say what was a reasonable return on capital and to put up the fares for the whole of London. What was the present share value of the capital? He did not want to act in an arbitrary way in the matter. He wanted to get help and consideration, and where could he get better consideration than from a Committee of the House of Commons? That was why he did not take action under the Ministry of Transport Act, and it was also the reason why he has asking the House to grant the second reading of the Bill, so that it should come before a Committee.

Railway Men and the Bill.

Mr. J. H. Thomas said that there were 500,000 members in his organisation (the National Union of Railwaymen). These men believed that there ought to be uniform conditions of pay on the railways. Forty-nine per cent. of the employees of the Underground Railways were covered by what was called the Government subsidy. These were the employees of the Metropolitan District Railway. Fifty-one per cent. were not covered, these being the employees of the tube railways. They were, however, all working for the same combine, were doing the same work, and were entitled to the same conditions. He accordingly supported the Bill, and he hoped it was not going to be a crime when employers and employees happened to agree. It was for a Select Committee to examine the question in all its bearings.

The Agreement with London Members.

In the course of further discussion Mr. Gilbert said that conferences of the London Members had been held on four different occasions with the chairman of the combine companies. As a result the London Members had agreed with the chairman that a certain instruction to the Select Committee on the Bill should be proposed in the House, and that it would be accepted by the promoters of the Bill. The instruction had been drawn up by the London Members in conference with the promoters, and he understood that not only the promoters but also the Government were willing to accept it. He hoped if the House gave a second reading to the Bill that it would also agree to the instruction.

After further debate, Mr. Thomas moved the closure, and it was carried by 137 votes against 21. A division was then taken on the second reading of the Bill, and this was resolved in the affirmative by 131 votes to 25.

The Instruction.

On the motion of Sir William Bull the following instruction was agreed to—

"That it be an instruction to the Committee to which the Bill may be committed, after inquiry into the financial position of the various companies named in the Bill, to amend the Bill as follows—

"(*a*) So as to provide that the maximum powers of charge in excess of the fares which the companies are now authorised to charge shall not be more than are required to provide from time to time for working expenses, efficiently maintaining and renewing the undertakings, and a reasonable return on capital;

"(*b*) That workmen's return fares between any two stations shall not exceed the single ordinary fare for a journey between those stations, with a maximum fare of threepence."

The London Tramway Bills.

At a sitting of the House on March 29, an instruction similar to the above was agreed to with reference to the London United Tramways Bill, the Metropolitan Electric Tramways Bill, and the South Metropolitan Electric Tramways Bill.

BRITISH ENGINEERING STANDARDS ASSOCIATION.

In conformity with the Articles of Association providing for rotation of office on the main committee, whereby one-third of the nominees retire each year, the Councils of the Technical Institutions who founded the Association have now made their new nominations, which took effect on March 31. The main committee is constituted a follows—

Sir Archibald Denny, Bart. (chairman).
Sir Maurice Fitzmaurice, C.M.G. (vice-chairman).

Sir John Aspinall Sir Arthur Duckham, K.C.B. Sir William Ellis, G.B.E. Sir William Matthews, K.C.M.G. Mr. Alexander Ross Dr. W. C. Unwin	Nominated by the Institution of Civil Engineers.
Sir Henry Fowler, K.B.E. Sir Vincent Raven, K.B.E. Dr. William H. Maw	Nominated by the Institution of Mechanical Engineers.
Dr. Arthur Cooper Mr. M. Mannaberg Mr. Benjamin Talbot	Nominated by the Iron and Steel Institute.
Sir W. E. Smith, C.B. Sir Thomas Bell, K.B.E.	Nominated by the Institution of Naval Architects.
Col. R. E. Crompton, C.B. Sir John Snell Mr. C. H. Wordingham, C.B.E.	Nominated by the Institution of Electrical Engineers.
Mr. F. W. Gilbertson Mr. F. R. Davenport	Co-opted by the nominated members to represent the Federation of British Industries.
The Hon. Sir Charles Parsons, K.C.B. Sir Richard Glazebrook, K.C.B. Sir Robert Hadfield, Bart.	Co-opted by the nominated members.

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ELECTRIFICATION OF RAILWAYS.

APPOINTMENT OF A COMMITTEE BY THE MINISTER OF TRANSPORT.

In our issue of February 12 it was stated that the Ministry of Transport was engaged in the formation of a committee to consider and report to the Minister on the question of the electrification of railways. On Tuesday the Ministry announced that the Committee had been formed and had met for the first time on the previous day. It is constituted as follows—

Sir Alexander Kennedy, LL.D., F.R.S., chairman.
Sir John Aspinall.
Mr. A. R. Cooper (representing the London Electric Railways).
Mr. Philip Dawson.
Sir Alexander Gibb, K.B.E., C.B.
Mr. C. H. Merz.
Sir Philip Nash, K.C.M.G., C.B.
Mr. Roger T. Smith (representing the Institution of Electrical Engineers).
Sir John Snell.
Sir Henry Thornton (representing the Railway Companies' Association).

Major Redman, secretary.

The terms of reference to the committee are that the committee should report on—

(i.) Whether any regulation should be made for the purpose of ensuring that the future electrification of railways in this country is carried out to the best advantage in regard to interchange of electric locomotives and rolling stock, uniformity of equipment, and/or other matters.

(ii.) If any such regulations are desirable, what matters should be dealt with, and what regulations should be made.

(iii.) How far is it desirable, if at all, that railways or sections of railways already electrified should be altered so that they may form parts of a unified system.

In his presidential address to the Institute of Transport, Sir Eric Geddes, after referring to the capital wasted in "the battle of the gauges," said we were on the eve of great extensions of the application of electricity to railway practice, and suggested that the Institute could act as an impartial umpire in the battle between alternating current and direct current, "remembering always that the scientifically ideal best was not necessarily the same as the best practically possible."

L.C.C. TRAMWAY FARES.

SHORTER STAGES—CHEAPER FARES IN SLACK HOURS.

There was a record meeting of the London County Council on Tuesday, March 9, of over 16 hours, the greater part of the time being taken up with discussion of the proposals of the Highways Committee for a further increase in fares. There were 26 divisions, the Progressive and Labour Parties stoutly refusing to give permission to the tramway administration to increase fares up to the statutory limit. Eventually, about 7 a.m. (Wednesday), the recommendations of the Highways Committee fixing the following scale of fares were adopted on a final division by 44 votes to 36—a little over half the number of members.

(1) New Ordinary Fares.	Present Rate
1d. for approximately 1·2 miles.	1d. for 1·5 miles.
2d. for approximately 2·4 miles.	2d. for 3 miles.
3d. for approximately 3·6 miles.	3d. for 4·5 miles.
4d. for any further distance (continuous journey on one car).	The same.

(2) Proposed Workmen's Fares.

1d. single and 2d. return (without transfer) for approximately 2·4 miles (single journey).
2d. single and 4d. return (without transfer) for approximately 4·8 miles (single journey).
3d. single and 6d. return (including transfer facilities as now given for 2d. single and 5d. return tickets) for any further distance.

Mr. Hume, the leader of the Moderates, agreed to the appointment of a special committee of inquiry into fares and the whole question of tramway operation and the general position of the undertaking.

The Highways Committee, in a detailed report on the revision of fares, said it was originally anticipated that there would be a surplus for the current financial year of £962,461, and net surplus to be transferred to the renewals fund of £212,567. The committee now intimated that these results would not be realised, and that there would be a considerable deficit on the year's working, which, with the cost of renewals to be carried out during the year, would more than exhaust the available balance in the renewals and general reserve fund. It is estimated that the passenger receipts will fall short by £212,215 of the amount which it was expected would be earned, while the working expenses will, it is anticipated, exceed by £106,540 the original estimate. The increases in wages have added to the difficulty, and it now appeared that in 1920-21 the total wages increase would amount to £2,942,000, an increase of 167 per cent. compared with 1913-14. The following particulars show the rise in passenger receipts and working expenses per car-mile since 1913-14—

Year.	Passenger Receipts a Car Mile.		Working Expenses a Car Mile.	
	Amount.	Per cent. Increase over 1913-14.	Amount.	Per cent. Increase over 1913-14.
1913–14	8·94	—	6·50	—
1914–15	9·50	6·26	6·89	6·00
1915–16	11·42	27·74	8·44	29·85
1916–17	12·01	34·34	8·82	35·69
1917–18	13·97	56·26	10·38	59·69
1918–19	17·33	93·85	14·27	119·54
*1919–20	18·87	111·07	16·54	154·46

* Partly estimated figures.

Comparison of receipts and expenses per car-mile in 1913-14 and 1919-20 are given below—

	1913–14.	1919–20.	Percentage Increases.
Expenditure a car-mile—			
Wages	4·14	11·15	169·32
Fuel	·59	1·71	189·83
Other expenses, including war service allowances	1·77	3·68	107·91
Total	6·50	16·54	154·46
Receipts per car-mile	8·94	18·87	111·07

Under existing conditions and on the present basis of fares and working expenses, the deficiency of revenue is estimated at £137,000 for the current financial year, and £580,000 for the year 1920-21. The working expenses are not likely to be sensibly reduced in the near future, and the committee point out that if the financial equilibrium between receipts and expenses is to be preserved, the revenue of the undertaking must be increased.

In a report submitted to the Committee the general manager (Mr. A. L. C. Fell) expressed the opinion that the competition of the motor omnibuses was in a large measure responsible for the receipts from the tramways during the present year falling below the estimate. Since February, 1919, this competition on tramway routes had increased by 26 per cent. Approximately 600 motor omnibuses were now operating through the day over the Council's tramway system, and he anticipated that if only sufficient omnibuses were retained on tramway routes to deal with overlapping traffic there would be a net gain in revenue of £500,000 a year.

The Special Committee of Inquiry presented an interim report on the question of fares on March 30. They recommended that the increased fares set out above should be put into force on April 5, but that with a view to attract passengers during the slack hour period special fares should be charged. Such a change would involve a loss of revenue from existing mid-day traffic; but the committee thought that the granting of such fares might create enough new traffic not only to neutralise the loss but to produce an increase. Shopping and pleasure traffic would almost certainly bring a considerable amount of entirely new traffic, and some passengers now travelling during rush hours might be able to alter their arrangements so as to take advantage of a cheap fare in one or both directions, and this would reduce the load on the rush hour. So long as the difference between the rush hour and the slack hour traffic is so marked it is impossible to avoid long spread-over duties, but if the mid-day service could be increased this difficulty would be minimised and better labour conditions would result. Increased car-mileage would also reduce the cost per car-mile in respect of capital charges, and of certain operating expenses which do not rise in proportion to an increase in the car-mileage. Consequently any step tending to equalise the load on cars throughout the day would be of great benefit from an operating point of view, and would also promote economy. As a result of their investigations the committee advised that if the Highways Committee agreed with their views effect should be given to the recommendation at the same time as the new fares come into operation.

On this report the Highways Committee presented an emergency report, which was adopted, recommending—

That, as an experiment, for all distances in excess of the ordinary 1d. fare stage of approximately 1·2 miles, a maximum fare of 2d. be charged on the Council's tramways for a continuous journey on one car on weekdays from Monday to Friday inclusive, excepting Christmas Day, Good Friday, and on all bank holidays or proclaimed national holidays, such fares to be charged on all cars timed to arrive at London termini between 10.30 a.m. and 4.30 p.m., and on all cars leaving London termini between 10 a.m. and 4 p.m.

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PARTIALLY DISABLED MEN AS DRIVERS.

RECOMMENDATIONS OF THE SECOND COMMITTEE.

A White Paper has been issued giving the report of the Committee appointed by the Home Secretary on December 14, 1918, to review the conclusions arrived at by the Committee on the Licensing of Partially Disabled Men as drivers of public motor vehicles which reported in 1916, and to report whether those conclusions should be reaffirmed or modified.

All the witnesses who gave evidence before the first Committee were invited to attend again if they desired to modify or add to their views, but the only old witnesses who did so were Supt. Bassom, of the Public Carriage Branch at New Scotland Yard, and Mr. Bundy, of the Owner Drivers' Branch of Vehicle Workers. Seven new witnesses attended.

The Committee comprised Mr. F. L. D. Elliott (chairman), Mr. H. E. Blain (operating superintendent of the London General Omnibus and Underground Group), Mr. C. W. Bowerman, M.P., Major Tudor Craig, Mr. A. L. C. Fell (general manager, London County Council Tramways), Sir Julian Orde (secretary of the Royal Automobile Club), Mr. R. J. Simpson, Mr. A. Smith (London and Provincial Union of Vehicle Workers). and Col. H. J. Waring, M.S., F.R.C.S.

The Committee's report was as follows :—

RECOMMENDATIONS.

As regards cases where the partial disability takes the form of loss of hand, or arm, or foot, or leg, we entirely concur with the previous report. We also concur that "minor disabilities" should be dealt with in the way recommended in that report, viz., that each application should be considered on its merits. As regards eyesight, we think that there should be a certain modification. We learn that, as a result of the report of 1916, some licensed men who had been driving public vehicles for years were deprived of their licences through failure to come up to the standard laid down in that report. We greatly regret that any such necessity should arise. At the same time, in view of modern traffic conditions, the question of eyesight is of paramount importance. On the one hand, we should be disposed to strain a point where possible with a view to prevent men from losing their employment; but, on the other hand, there is the duty to the public of preventing men who are liable to be a source of danger from driving public vehicles.

After considering the problem from all aspects, our opinion may be summarised as follows :—

No man with only one eye should be allowed to drive a public vehicle.

For all other men regular standards of ocular efficiency should be introduced.

There should, in our opinion, be two standards of efficiency of vision—

(1) A high standard, on the basis laid down in the previous report, to be applied to all new entrants;

(2) A lower standard to be applied to men who have been continually licensed for three years or more, and whose disability may to some extent be deemed to be balanced by their practical experience.

We recommend that the Royal College of Surgeons be invited to assist the Commissioner by drawing up the two standards in consultation with his representative and with a representative selected on behalf of the drivers. If issued with the authority of the Royal College, the standards would be more likely to command general approval. Men who lost their licences on account of the principles set out in the report of 1916 can then be dealt with under the lower standard if they still wish to be licensed.

We feel, however, bound to make the reservation that it is only, in our opinion, possible to make concessions in the matter of eyesight if some machinery can be devised for bringing to notice defects in eyesight which may develop after a licence has been granted.

For this purpose we suggest that in the case of new entrants or those who obtained licences under the lower standard of efficiency of vision, the licensed man should in future be required to submit every five years a medical certificate as to eyesight. A "new entrant" should include those men who have not yet been licensed as drivers of public vehicles for twelve months. In the cases of men already licensed we recommend that, if possible, some empiric test of eyesight should be carried out at New Scotland Yard when application is made for renewal of licences. If the result gives ground for suspecting some substantial deterioration of vision, the applicant should (where necessary) be referred to a specialist for an expert examination at the expense of the Police Fund.

CONCLUSIONS.

The Committee therefore recommend that the conclusions arrived at by the Committee which reported in July, 1916, should be reaffirmed so far as they relate to cases of loss of hand, arm, or foot, or leg, and to "minor disabilities." As regards eyesight, however, they recommend that the conclusions be modified on the lines indicated in the preceding paragraphs.

EYESIGHT OF DRIVERS.

The new witnesses included Mr. A. C. Hudson, F.R.C.S., one of the three surgeons who act for the Metropolitan Police in examining the eyesight of applicants for licences. In the course of his evidence he said :—My own feeling is that drivers of motor cars and of motor omnibuses, tramcars, and motor cabs should have two eyes, and that they should have the full field of vision. Unless they have two eyes they cannot have their full binocular field. One eye should have good vision, and in the case of tramcar drivers and omnibus drivers they should be without glasses. I do not think that tramcar drivers and omnibus drivers should be allowed to wear glasses, because of the trouble which they experience in heavy rain, often associated with bad light. Another point is that, with very high-powered glasses, such as might be necessary to bring vision up to the standard which was thought essential, a good deal of light is cut off, and a man suffers considerable disability on that account, particularly in the case of myopic persons with high-powered glasses. I do not object to the cab driver wearing glasses, because he is better sheltered, and has not the responsibility, particularly the responsibility of the omnibus driver.

There is a Committee sitting at the present time which was appointed by the Council of the British Ophthalmologists to collect, as far as possible, definite evidence as to what degrees of visual disability were actually dangerous to the public, and as to how far such disabilities were responsible for accidents. It was suggested that a large series of cases of men who had had accidents should be examined as to their visual ability, and as far as possible definite evidence should be obtained in that way. Major Carruthers, R.A.M.C., who is a member of the Committee, has obtained a certain amount of information from army sources, from drivers in the A.S.C., and that also is being gone through. One hopes in that way that it may be possible to obtain really definite grounds for forming one's judgment as to what is a fair standard of visual acuity.

Mr. Fell.—Would you differentiate between a driver who is driving a tramcar on a fixed rail and the driver of a motor omnibus ?—I think that the man who really requires the highest standard of vision is the omnibus driver.

So that you could possibly institute a lower standard for tramcar drivers than for motor omnibus drivers ?—Yes, you could have a lower standard, I think. There is one other point I have not mentioned, and that is the question of stereoscopic vision, the judgment of the distance of objects, their solidity, and so on; for instance, a pole sticking out behind a cart in front. That is dependent to a certain extent on the possession of binocular vision. I do not think this is compatible with a vision of much less than 6/24ths in the more defective eye, and that is why I think that for the omnibus driver probably 6/24ths is about as low a standard as can be fixed for the more defective eye.

Mr. A. Smith.—You strongly object to the omnibus driver having glasses, but you do not object so strongly to the taxi man or tramcar driver ?—I would not allow either an omnibus man or a tramcar driver to wear glasses because they are so likely to be obscured by rain.

But in some parts of the country we have the driver surrounded by glass, and rain cannot get at him, and we do not hear of any particular accidents there. I should think it would be better for a man, particularly on a cold and windy day, to have glasses on than the naked eye ?—There comes in the question of the steam on the glasses.

Yes, the condensation. We have plenty of cases where uien have glasses and we do not hear of accidents with them, and that seems to me to be the more practical test.

The standard that has been set up has resulted in some men, after holding a licence for many years, losing their licence ?—I should have thought that an omnibus driver and a tramcar driver would, under certain conditions of weather, become dangerous if they had glasses.

SANDBERG RAIL-HARDENING PROCESS.

The London County Council have adopted a report of the Highways Committee recommending that the Sandberg rail hardening process be tried on the Council's tramways. The report stated that the process had been inspected on a number of other tramway systems, and although sufficient time had not yet elapsed to determine the exact value of the treatment, it was estimated from measurements taken that the life of the rails on those systems would be prolonged by about three and a quarter years.

This would represent an ultimate saving, after allowing for the cost of the treatment, of £625 per mile of single track, and disturbances of traffic caused by the opening up of the roadway for renewals would be correspondingly less. The absence of corrugation on the treated rails had also been noted, and the cost of rail grinding would consequently be saved. The cost of hardening the surface of the rails for one mile of single track would be about £2,500, and the committee proposed that this amount should be expended in applying the treatment to certain sections of the track where heavy wear occurs, such as stopping places and curves.

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WAR HONOURS.

In the list of promotions in and appointments to the Order of the British Empire for services in connection with the war, which was published in a special supplement to the *London Gazette* issued on March 30, are the following—

KNIGHT COMMANDERS (Civil Division).

R. H. DENNIS, services in connection with the supply of motor lorries and fire engines.

JAMES DEVONSHIRE, managing director, London United Tramways, Limited, and the London and Suburban Electric Traction Company, Limited.

JOHN DEWRANCE, chairman, Babcock and Wilcox, Limited.

G. K. B. ELPHINSTONE, G.B.E., valuable services in the design and manufacture of fire control apparatus for the navy.

A. M. SUTHERLAND, ex-Lord Mayor of Newcastle, and vice-chairman of Newcastle Tramways Committee.

COMMANDERS (Civil Division).

H. E. BLAIN, operating manager, London Underground Railways.

JAMES DALRYMPLE, general manager, Glasgow Corporation Tramways.

A. L. C. FELL, general manager, London County Council Tramways.

J. B. HAMILTON, general manager, Leeds Corporation Tramways.

R. J. HOWLEY, vice-chairman, Tramways and Light Railways Association.

G. W. HUMPHREYS, chief engineer, London County Council.

A. M. JACK, managing director, Hadfields, Limited.

C. P. SANDBERG.

H. SCHOLEY, London member of the Clyde Anti-Submarine Committee.

OFFICERS.

SAMUEL FLINT, J.P., late president of the Municipal Tramways Association and chairman of Leicester Tramways Committee.

T. B. GOODYER, manager, Croydon Corporation Tramways.

S. F. JAMES, secretary to the Tramways Committee, Board of Trade.

C. J. SPENCER, late secretary of the Municipal Tramways Association.

A. DE TURCKHEIM, secretary, Tramways and Light Railways Association.

MEMBERS.

J. H. O. BARNARD, general manager, Bolton Corporation Tramways.

MAJOR FREDERICK COUTTS, general manager and electrical engineer, Paisley District Tramways Company.

HARRY ENGLAND, general manager and secretary, Yorkshire (West Riding) Electric Tramways Company, Limited.

W. E. HARDY, general manager and engineer, Bath Electric Tramways Company, Limited.

R. L. HORSFIELD, late general manager, Walsall Corporation Tramways.

G. R. HUME, Tramways (Board of Trade) Committee.

W. T. ROBSON, late general manager, Southampton Corporation Tramways.

V. WATLINGTON, of Messrs. Dick, Kerr and Company, Limited.

HARRIS WATSON, assistant manager, Sheffield Corporation Tramways.

J. N. WILSON, secretary, Glasgow Corporation Tramways.

N. J. YOUNG, general manager, Newport Corporation Tramways and Electricity Department.

LONDON TRAFFIC CONGESTION.

A SCHEME TO REDUCE THE PEAK LOAD.

The Ministry of Transport has announced that the Advisory Committee on London Traffic has had under consideration the problem of relieving the serious congestion of traffic in London during the morning and evening peak-load hours, *i.e.*, between 7.30 and 9 in the morning, and 5 and 7 o'clock in the evening. It is in the evening that the heaviest congestion occurs, and little or no relief can be looked for in the near future from any increase of the transport facilities during these hours.

The Advisory Committee has had a conference with representatives of the London Chamber of Commerce, the National Union of Clerks, the Early Closing Association, and Government Departments on the matter, and steps are being taken by some of these bodies to ascertain the extent to which the hours of working in Central London can be varied so that a larger number of employees may be enabled to leave between 4 and 4.45 p.m., instead of at 5 o'clock or later. The Advisory Committee believes that substantial benefit would result from the adoption of some such measure.

Any suggestions or communications on the subject should be sent to the Secretary to the Advisory Committee, Mr. J. A. C. Champion, Development Department, Ministry of Transport, 6, Whitehall Gardens, S.W.1.

PERSONAL.

Lieut.-Colonel Fraser, D.S.O., has been appointed superintendent of organisation for the Yorkshire Electric Power Company.

Mr. W. Forbes, general manager of Aberdeen Corporation tramways; has been granted an increase in salary of £100 per annum.

Mr. R. Leigh Griffin, of the City of Santos Improvements Company Limited, Santos, Brazil, sailed for England on March 28 on leave of absence.

Mr. A. R. Dayson, general manager of Sunderland Corporation tramways, has been granted an increase in salary from £700 to £850 per annum.

Mr. J. C. Whiteley, general manager of South Shields Corporation tramways, has been granted an increase in salary from £500 to £600 per annum.

Mr. B. D. Porritt, M.Sc., F.I.C., F.R.S.E., has been appointed by the Research Association of British Rubber and Tyre Manufacturers as Director of Research.

Mr. Donald McColl, general manager of Shanghai Electric Construction Company, Limited, and Shanghai Tramways, is now in this country, and will remain for several months.

Mr. J. F. Dixon, of Southampton Corporation tramways, has been appointed manager of the Mansfield and District Light Railway Company, in succession to Mr. Tattam, who has resigned.

Mr. C. D. Johnson, deputy comptroller of the London County Council, has been appointed comptroller in succession to Sir H. Haward, at a salary of £1,000 a year, rising by annual increments to £2,000.

Mr. C. R. Tattam, manager of the Mansfield and District Light Railway Company, has accepted an appointment with Messrs. Balfour, Beatty & Company. Mr. Tattam became manager at Mansfield in February of last year.

Mr. Arthur Edge has been appointed by the Cape Town City Council as station engineer at the municipal power station at a salary of £600 per annum. Mr. Edge has been shift engineer to the Victoria Falls Power Company.

Mr. R. B. Mitchell, assistant engineer and manager of Glasgow Corporation electricity department, has been appointed general manager and engineer, in succession to Mr. W. W. Lackie who was recently appointed one of the Electricity Commissioners.

Mr. A. G. Clarke, chief publicity assistant, development committee of Sheffield Corporation, has been appointed publicity assistant of the London County Council tramways, at a salary of £300 per annum, rising by annual increments of £25 to £400 with a temporary war allowance of 20 per cent. and a war bonus of £70.

Mr. P. J. Pringle, general manager and chief engineer of the Electric Supply Company of Victoria, Limited, Australia, expects to arrive in England about the middle of April. Mr. Pringle's business address while in this country will be the Electric Supply Company of Victoria, Limited, 255, Royal Liver Building, Liverpool.

Mr. Alfred Baker, general manager of Birmingham Corporation tramways, who has been seriously ill following an operation on March 17, is making a satisfactory recovery. Mr. Baker's illness made it impossible for him to attend the recent important meetings of the Municipal Tramways Association and the National Industrial Joint Council for the tramway industry.

Mr. E. P. Bennett has been appointed secretary and sales manager of the Simplex Conduits, Ltd., Birmingham. He has held a number of positions in the company, including that of manager in London, and has had long experience in the electrical business. During the war he held a technical commission in the R.A.F., and after the armistice visited a number of European countries to study the possibilities of electrical markets.

Mr. G. G. Braid, who has recently been appointed chief deputy engineer of the Glasgow Corporation tramways department, received his education at the Heriot-Watt College and at the Glasgow Royal Technical College. He entered the service of the Corporation tramways department in 1901, just before the electrification of the whole system, as assistant engineer and was promoted later to chief electrical assistant. During the war he acted for the Ministry of Munitions in a voluntary capacity as inspector of engineering works, and later as captain and adjutant of the second battalion.

Mr. John Terry, acting traffic operation superintendent of the London County Council tramways, after reaching the age of 69 years, retired on March 2, after nearly 40 years' tramway service. The Council have voted Mr. Terry a grant of duty pay amounting to £500 in view of his loyal and efficient services in exceptional circumstances. Mr. Terry in addition to the grant would receive out of the superannuation and provident fund a retiring allowance of one-third of his average salary during his last five years of service and whatever percentage of war allowance and bonus the Council may grant as from January 1, 1920.

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FINANCIAL REPORTS AND MEETINGS.

MANILA ELECTRIC RAILROAD AND LIGHTING CORPORATION.—A dividend of 1½ per cent. for the quarter ended March 31 has been announced on capital stock.

METROPOLITAN-VICKERS ELECTRICAL COMPANY, LIMITED.—A dividend has been declared on the ordinary shares at the rate of 8 per cent. per annum for the year ended December 31.

LOSS ON DOUGLAS CABLE TRAMWAY.—Douglas Town Council is losing £150 a week on the running of the cable tramway during the winter. Even with a good season the loss is estimated to be £4,000 a year. Costs have increased threefold as compared with pre-war charges and the committee have been urged to consider another form of traction or to discontinue the service.

THOMAS TILLING, LIMITED.—An extraordinary general meeting was held on March 31, when a resolution was adopted providing that the capital of the company be increased from £675,000 to £1,000,000 by the creation of 325,000 new shares of £1 each, and that the sum of £154,424, part of the undivided profits, be capitalised and divided among the holders of the ordinary shares in the proportion to the amounts paid up.

BRITISH ALUMINIUM COMPANY, LIMITED.—A resolution has been passed, altering the articles so as to enable effect to be given to the board's proposal to increase the fixed capital to £1,500,000, and to capitalise £400,414, part of the reserve account, and to apply that sum in paying up in full at par £400,414 ordinary shares. These will be distributed to holders of the ordinary shares at the rate of three for every two at present held.

EAST HAM TRAMWAYS.—The Committee appointed by the Council to investigate the accounts of the electric lighting and tramways undertaking have submitted their report. This shows an estimated net deficit of £26,628 on the tramways and £4,677 on the electric lighting for the year ending March 31. The deficiencies are attributed to the payment of war bonuses, increase in the cost of coal, materials, etc., and the heavy renewals of cars and trucks.

BRUCE PEEBLES AND COMPANY, LIMITED, have done remarkably well during the past year and have declared their first dividend. The works have been fully employed, and the trading profit at £51,800 is £31,400 higher than a year ago. After writing off £28,000 for depreciation and reserve the profit balance is £19,200, or £10,500 more than last year. The full 10 per cent. dividend is paid on the preference shares, and an initial 7½ per cent. on the ordinary capital

GLOUCESTER TRAMWAY RATE.—The Mayor of Gloucester, Councillor J. L. Roberts, has stated that for the ensuing year the ratepayers will be called upon to pay a tramway rate of 1s. in the £. He added that when he became chairman of the Committee he thought they were going to be able to make the undertaking pay, but the war had upset everything. When they remembered how much wages had risen and that materials had advanced by something like 300 or 400 per cent., the citizens would realise that the Committee had done their best.

DERBY CORPORATION TRAMWAYS.—The annual report of Mr. F. Harding, manager of the Derby Corporation tramways, states that fresh records were created last year. The receipts amounted to £77,532, an increase of £13,798 over the previous year. The net profit of £8,190 was also the largest in the history of the undertaking. The average receipts per car mile were 18·370d., against 15·421d. in the previous year. The working expenses per car mile were 12·771d., an increase of 2·465d., which was due to wages, electricity, and materials all being very much dearer. The heaviest wage increase however, did not occur until towards the end of the financial year, so that the full effect was not felt.

LONDON COUNTY COUNCIL TRAMWAYS OBSOLETE CAPITAL EXPENDITURE.—In view of the heavy additional charges which will fall upon the London County Council tramways in each of the fifteen years from March, 1914, amounting to about £37,000 in 1914-15 and gradually diminishing to about £28,000 in 1929, the question of expediting the repayment of the debt in respect of obsolete capital charges has been postponed from time to time, on the last occasion to the year ending March 31, 1920, when the obsolete capital debt outstanding amounted to £857,239. The renewals fund and general reserve fund have now been exhausted, and a considerable deficit is anticipated in the year 1920-21; the question has, therefore, been further postponed until March 31, 1923.

HADFIELDS, LIMITED.—The report for the past year shows a profit of £203,154 (which compares with £202,896 in the previous year) making with the amount brought forward £307,254. The sum of £200,000, premium received on the issue of ordinary shares, has been carried to a special reserve. The directors recommend in addition to the interim dividend of 6d. per share paid in July a further dividend of 1s. 6d. on the ordinary shares, tax free, carrying forward £133,754. A resolution was proposed at the meeting held on March 29 authorising the increase of capital by £500,000 in order to enable the agreement for an interchange of shares with Harper Bean, Limited, to be carried into effect, and leaving a balance of £333,334 to be issued if and when the directors think desirable.

LEICESTER CORPORATION TRAMWAYS.—Mr. A. F. Lucas, manager and secretary of Leicester Corporation Tramways, in his report for the year ended December 31 last, states that the total revenue for the year 1919 amounted to £362,566 9s. 11d., an increase of £66,850 3s. The passengers carried numbered 62,434,056, an increase of 11,450,833, and the cars ran 4,000,604 miles, or an increase of 274,142 on the previous year. The total receipts averaged 21·750d. per mile, against 18·993d. last year, an increase of 2·757d. per car mile. During the year there has been an increase in passenger receipts of £60,028 1s. 10d. over the year 1918. The working expenses amounted to £294,300 17s. 6d., an increase of £75,794 7s. 3d. This was chiefly due to increased wages to employees and to the higher price of materials. The gross profits amounted to £68,265 12s. 4½d., against £76,409 16s. 8d. last year, and interest, sinking fund, income tax, bank interest and war allowance to employees in H.M. Forces, etc., were £57,351 17s. 10d., against £59,912 10s. 11d., a decrease of £2,560 13s. 1d., leaving a net balance to the credit of appropriation account of £10,913 14s. 6d. In the previous year the net balance was £16,497.

LIVERPOOL TRAMWAYS.—The annual report of the general manager, Mr. C. W. Mallins, for the year ended December 31, 1919, has been published. It is a volume of about 100 pages, with several interesting appendices giving various information in regard to traffic, etc., and a map of the Liverpool tramway system. Mr. Mallins states that the Prescot light railway was purchased by the Corporation on October 1, 1919, and that it is now possible for passengers to travel from the Pier Head to Brook Bridge, Prescot, without change of cars. The length of the new line is 3⅛ miles. Reference is made to the decision of the committee, on the recommendation of the general manager, to construct three loop lines at the Pier Head. During the year under review 25 new cars supplied by the English Electric Company were placed in service, and in addition to the maintenance work carried out at the Lambeth Road repair works, two new cars were completed. Thirty new omnibuses were obtained from the Associated Equipment Company. A new garage for motor omnibuses was erected by the department's staff on the site of the old horse depot at Broad Green Road, and the latest system of underground petrol tanks and tar presses was installed there. About 6·75 miles of trolley wire were renewed during the year.

FINANCIAL RESULTS.

The results for the year ended December 31, 1919, compared with those of the four preceding years, are as follows—

	1919.	1918.	1917.	1916.	1915.
	£	£	£	£	£
Capital expenditure ...	2,129,706	2,068,395	2,068,430	2,068,453	2,068,453
Loan outstanding ...	914,397	950,988	998,244	1,008,694	1,212,713
Traffic revenue ...	1,178,846	962,538	818,756	738,321	696,893
Total revenue	1,207,229	989,504	845,645	766,577	726,078
Working expenses ...	1,029,444	716,479	575,267	518,037	488,274
Gross balance	177,785	273,025	270,378	248,540	237,804
Net profit	75,485	169,322	167,243	145,971	123,193
Average fare per passenger	1·358d	1·184d.	1·137d.	1·124d.	1·109d
Traffic receipts per track-mile	£9,282	£7,762	£6,602	£5,954	£5,620
Traffic receipts per car-mile	21·46d.	18·91d.	15·56d.	13·97d.	13·20d.
Power cost per car-mile	2·973d.	2·740d.	2·584d.	2·490d.	2·348d.
Operating cost per car-mile	18·739d.	14·082d.	10·880d.	9·798d.	9·240d.
Total charges per car-mile	20·601d.	16·120d.	12·890d.	11·738d.	11·409d.
Ratio of expenses to revenue	85·27%	72·40%	68·02%	67·5%	67·2%
Total track mileage ...	127	124	124	124	124
Number of cars in stock	625	—	598	598	599
Car mileage	13,184,277	12,210,763	12,630,577	12,688,163	12,682,018
Passengers carried ...	208,251,496	195,082,609	172,842,494	157,636,595	150,755,680

BUSINESS NOTICES.

TRAMWAY SUPPLIES, LIMITED, of 160, Woodhouse Lane, Leeds, have removed to Grove Mills, Meanwood, Leeds, where all communications should be sent.

JOHNSON AND PHILLIPS, LIMITED, announce that their Cardiff office has been removed from 9, Park Place, to 2A, Court Road. The telegraphic address and the telephone number remain the same.

MESSRS. HANDCOCK, DYKES AND TROTTER, consulting engineers, of 11, Victoria Street, London, S.W., have resumed their old name of Handcock and Dykes. Mr. Trotter retired in order to devote himself to scientific work.

THE ENGLISH ELECTRIC SUPPLIES, LIMITED, have purchased the business of the Britannia Lamp and Accessories Company Limited, of 48, Milton Street, London, E.C., together with the stocks, patents, trade marks, etc. The new company have retained the entire staff both in London and the branch offices, and will carry on the business on the same lines with the addition of new electrical devices that will shortly be placed on the market. The offices of the company are at Brook House, 191 and 192, Tottenham Court Road, London, W.1, to which all communications should be addressed, as Britannia House is being retained as a warehouse only.

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TRAMWAY AND LIGHT RAILWAY NOTES.

ASHTON-UNDER-LYNE.

TRAMWAY PURCHASE.

Sir Maurice Fitzmaurice is the arbitrator in the proceedings between the Ashton Corporation and other local authorities and the Ashton, Oldham and Hyde Electric Tramways Company for the purchase of the undertaking by the local authorities.

BLACKBURN.

LECTURES TO TRAMWAY EMPLOYEES—SUDDEN COLLAPSE OF A DRIVER.

An interesting lecture on "The Electrical Equipment of Tramcars" was given to the employees of Blackburn Corporation Tramways on the evening of March 18 at the Intack Depot by Mr. W. Willets, armature winder to the department. The lecturer gave details of many minor faults which could be rectified by the men themselves, and fully explained the uses and abuses of the electric brake. About 60 employees were present, together with the manager, works superintendent, chief clerk, chief inspector, and Mr. B. H. Marsden, of the Town Clerk's department. Mr. Cowell, the manager, in proposing a vote of thanks to the lecturer, pointed out how evident it was that if the men followed the instructions given by Mr. Willets a great saving would be brought about both by reducing the quantity of units consumed and lessening the cost of repairs. The lecture was repeated on March 25 for the benefit of those employees who were unable to attend owing to being on duty. The management is also arranging for two lectures to be given to the conductors by Chief Inspector Riley on "How to Become Efficient in Your Duties." As a car was running up Preston New Road recently, a pedestrian drew the attention of the conductor to the condition of the driver. The conductor at once went to the front of the car and found the driver in a crouching position over the gate at the side of the car and bleeding from a wound at the back of the head. He subsequently explained that when looking out to see if the passengers were about to board the car something struck him on the back of the head, and, feeling faint, he shut off the current and then became insensible.

BRADFORD.

TRAMWAYMEN'S CLUB.

The new social club and rooms of the Bradford Corporation Tramways Employees' Social and Athletic Society were opened by the Lord Mayor, Alderman William Wade, on March 17. Mr. R. H. Wilkinson, general manager of the tramways, on behalf of the employees, said that they were deeply grateful to the Tramways Committee and others who had provided the rooms. The main object of the society was to secure recreation and better social conditions for the men when off duty. The department would be able to carry out its work more efficiently on account of the new opportunities for recreation which had become available to the employees. The Lord Mayor, in opening the rooms, said that there was not a better body of men than those on the Corporation's tramways. They were often much tried by thoughtless passengers, who seldom realised what a conductor had to put up with at times. The employees are to contribute one shilling per week towards the maintenance of the rooms, and already 1,300 of the men have joined.

BRIGHTON.

INCREASE OF FARES.

Brighton Tramways Committee recently presented a report to the Council with reference to the financial position of the tramways undertaking, and recommended certain increases in fares. An increase was made on March 31, 1919, but the committee were unable to state accurately the additional revenue the increased fares brought, but estimated that the addition amounted to a little over £20,000. This estimate is based upon the fact that the average fare paid per passenger for the year ended March 31, 1919, was 1·09d., and for the year ending March, 1920, approximately 1·33d. If no further increase is decided upon, it is estimated that there will be a deficit of £30,000. Mr. William Marsh, engineer and manager, in his report, remarked that this appeared at first sight to be serious, but he thought there would be no difficulty in raising the necessary £30,000 if the 1d. fares are abolished and other adjustments made. The committee therefore recommended that the existing 1d. fares be abolished and that a fare of 1½d. be substituted as from April 1, and the Council subsequently decided to approve the proposed charge.

BURNLEY.

INCREASE IN FARES REFUSED—SHORTAGE OF COAL—DOUBLING OF LINE.

The proposal of the Burnley Tramways Committee to raise the minimum fare to 1½d. has been rejected by the Town Council. The opponents to the proposal maintained that the Tramways Committee had given the Council insufficient time to consider the scheme, and some of the speakers said that injustice would be done if the minimum fare were raised to 1½d., as short-distance passengers would be penalised. Alderman Rase criticised the committee for not having taken steps to obtain powers to increase long-distance fares. The tramway service was suspended on Sunday, March 14. The electricity department had given previous notice to the Tramways Committee that owing to the shortage of coal they would be unable to supply energy for traction. Recently the electricity department have received little more than a day-to-day supply during five days of the week, and none whatever was delivered on Saturday, when the load is the heaviest. The consumption on that day is 70 tons, and consequently a great inroad has been made on the small stock. The service was again suspended on Sunday, March 28, the engineer having reported that the supply was even less satisfactory than for the previous week-end. The Borough Surveyor and the Tramways Manager have been instructed to report in regard to the proposal to lay a double line of tramway in place of the single line in Todmorden Road.

CARDIFF.

ROLLING STOCK AND TRACK—QUESTION OF MOTOR OMNIBUSES.

Mr. R. L. Horsfield, who was recently appointed general manager of Cardiff Corporation Tramways, attended a special meeting of the Cardiff Tramways Committee on March 24, when Sir John Courtis presided. The committee were unanimously of opinion that a number of new cars should be purchased, and after discussion referred the matter to Mr. Horsfield for consideration and report. Mr. Horsfield advised that trucks and equipment should be purchased separately and that the assembling should be carried out at the tramway depot in preference to the purchase of a complete car, as he was of opinion that the Council would thus save considerable expense. It would be twelve months before an order for new cars could be executed, and he thought it might be desirable to run temporarily a number of motor omnibuses. Sir John Courtis remarked that the track needed extensive repairs before new cars were put into service, and Mr. Morley New, the engineer, said that during the past six months no fewer than ten axle-boxes and a number of gear cases had been damaged as the result of the present state of the track. Sir John pointed out that until they could obtain definite powers through the Council's Parliamentary Bill to run motor omnibuses, it would be inadvisable to place a contract. The committee asked Mr. Horsfield to report on the advisability of purchasing motor omnibuses.

DUBLIN.

DAMAGES FOR INJURY RECEIVED FROM TROLLEY HEAD.

A special jury has given an award against the Dublin United Tramways Company of £875 for damages caused by a trolley head falling on a boy. Judgment for the amount was given by Mr. Justice Dodd, who granted a stay of execution till the next term on the payment of £5 a week to the mother of the plaintiff. The conductor of the car said that shortly after the car stopped consequent upon the trolley leaving the wire he went on top to collect fares and saw the boy sitting with his hands on his head. Asked what was the matter he made no reply, nor did he make any complaint when leaving the car. After the accident he went to school, but subsequently inflammation of the brain developed. The driver of a passing car who saw the trolley leaving the wire and signalled to the driver, said that the trolley did not fall straight down but swayed round in a lateral direction. Mr. G. M. Harriss, general manager of the tramway company, said that the car was properly equipped. Trolleys left the wires occasionally everywhere. No means had yet been devised to prevent trolleys leaving the wires, but they invariably tilted straight up instead of downward. In cross-examination attention was drawn to the fact that on the Lucan tramways a steel bar had been placed along the top of the car to protect passengers from being struck by the trolley.

DUMBARTON.

HIGHER MAXIMUM FARE NECESSARY.

Dumbarton Burgh and County Tramways Company have informed Dumbarton Town Council that in consequence of the increase in wages and growing cost of materials they propose to apply for a revision of their maximum fares.

EAST HAM.

PURCHASE OF NEW CARS.

East Ham Tramways Committee have received a letter from the Public Safety and General Purposes Department of the Ministry of Transport conveying sanction to the borrowing of £8,750 for the purchase of four new cars. The sanction has been given on the understanding that improvements be made in the life-guards and that a side-guard be provided on the staircase side of the car. In connection with this proviso the engineer and manager, Mr. W. C. Ullmann, submitted a quotation from the Brush Electrical Engineering Company amounting to £8 per car for the provision of these side-guards. The committee recommended the acceptance of the quotation.

GLASGOW.

EXTENSIONS AND RENEWALS—PROVISIONAL ORDER GRANTED.

The general manager of the Glasgow tramways, Mr. James Dalrymple, recently reported on the work in prospect in connection with extensions and renewals. The figures given show the following estimated costs—Renewal of track, now being proceeded with, £100,000; construction of thirty new cars, work to be carried out as quickly as supplies can be procured, £30,000; new car depot, for which schedules of work are in course of preparation, £70,000, exclusive of price of ground; tramways extensions, which are

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being remitted to a special sub-committee for report at an early date, £600,000. A provisional order inquiry has been held in Glasgow into the application of the Corporation for powers to increase assessment in respect of a number of public undertakings, and principally to extend the time limit for the compulsory purchase of land for the completion of the tramways authorised by the Glasgow Tramways Act of 1914. The tramway proposed is designed to form a main artery between Kelvinside and the Maryhill district, and for that purpose a portion of the ground of Queen Margaret's College is to be acquired. The University authorities, who objected to an extension of time, alleged that there was no public necessity for the extension, the construction of which they contended would be prejudicial to their rights and interfere with the work carried on at St. Margaret's College. The preamble was, however, found proved.

GREENOCK.

CORPORATION AND THE TRAMWAYS.

In May, 1921, the undertaking of Greenock and Port Glasgow Tramways Company may be purchased by Greenock Corporation, and the matter is now being considered. The majority of the Council apparently favour municipalisation, but the difficulty is the cost of acquiring the tramways from the company. Gourock Town Council have expressed their readiness to co-operate with Greenock in the arrangement of a municipal service.

HASTINGS.

TROLLEY SYSTEM PROPOSED FOR SEA FRONT.

The Hastings Tramway Company have for a long time wished to replace the surface contact system on the front by the overhead trolley system, and with a view to removing any doubt as to the opinion of the residents the Company arranged for a poll to be taken. When the lines on the front were constructed some years ago it was stipulated that there should be no overhead wires, but the present arrangement whereby the cars have to pass from the overhead system to the surface contact is unsatisfactory, and the company desires to improve the service. Mr. Vincent Edwards, the manager, has stated that the work of reconstruction can be done in two months, and it is hoped that the change can be made before the summer season begins.

HULL.

PROTEST BY TRAMWAYS COMMITTEE—PROPOSED NEW BYE-LAW.

Councillor Richardson, deputy chairman of Hull Tramways Committee, protested at a meeting of the Town Council of the way in which members played shuttlecock with the considered decisions of the committee. The Council was rendering their position, he said, impossible, and was making it hopeless for them to achieve success. The Corporation Tramways Committee are seeking to introduce a new bye-law under which the onus of paying the fare will be placed on the passenger. If this bye-law is approved by the Board of Trade anyone leaving the car without tendering the fare will be liable to be proceeded against.

LEEDS.

INCREASE IN FARES TO PRESENT STATUTORY LIMIT.

The estimates submitted to the Leeds Tramways Committee for the ensuing year indicate a loss of £105,750 if the fares were not increased, and in view of the position the Tramways Committee decided to recommend an increase to the full statutory limit of 1d. per mile. At present the charges are 1d. for the first mile from the tramway centre and ½d. a mile for the rest of the journey. If the proposed revision is adopted by the City Council, the 1d. fare from the centre will remain as at present, the 1½d. fare will become 2d., and 2½d. fare 3d., the present 3d. fare 4d., and so on. Some time ago fares were raised 50 per cent., and as the present proposal involves a further increase of 50 per cent., all fares will then be double the pre-war charges. For workmen during specified hours the fares will be at the rate of ½d. a mile. It is estimated that the increased fares will bring in additional revenue of £108,500, allowing for an estimated reduction in traffic of 10 per cent. as a result of the increase.

LEICESTER.

FIFTEENTH YEAR OF ELECTRIC TRACTION—INCREASE OF COAL SUPPLY.

Mr. T. Robert Smith, engineer and manager of Leicester Corporation electricity department, in his report for the year ended December 31 last, mentioned that this was the fifteenth complete year of electric traction, the first lines having been opened in May, 1904. During the past year six open-top cars were provided with canopy tops in the Corporation workshops, which are at present engaged in the construction of six new cars of the top-covered type The increase in the stock of coal has enabled the Corporation Tramways department to run all cars from all the termini at 6.30 in the morning, and to continue as usual without curtailment until 10 p.m. This means a restoration of the ordinary services, except that the cars will start at 6.30 instead of 5.30 a.m., and stop at 10 instead of 11 p.m. The Sunday service was resumed on March 21.

LIVERPOOL.

DANGER OF THE TROLLEY HEAD—TRAMWAY QUEUES.

As a car was passing along Dale Street, Liverpool, on March 25, the trolley head fell and struck a pedestrian on the head. After treatment at a neighbouring hospital he was able to proceed. The tramways department has adopted the queue system at certain crowded places. Four have been arranged on either side of the old Haymarket with a distinctive sign above each queue, which will be illuminated at night.

LONDON.

CONTINUED USE OF TRAILER CARS—EMPLOYMENT OF WOMEN.

In October, 1915, the Board of Trade agreed that during the war the running of trailer cars on certain routes of the London County Council Tramways should be continued at all times of the day. The Ministry of Transport has approved of the continued use of such trailer cars on the understanding that such approval might be withdrawn at any date. An illustrated description of the trailer cars used on the Council's tramways was given in THE TRAMWAY AND RAILWAY WORLD of October 14, 1915. The services of women conductors was discontinued on October 29, 1919, and women car washers have been replaced by men. Women were also employed largely at the central car repair depot on work of an unskilled character in the repair of cars. In cases in which men's places were taken by women during the war period pre-war practice has been restored, and the women have been discharged. Arrangements have been made for the employment of women and girls on work such as taping and insulating armature, field and other coils, and as mess-room attendants and cleaners.

NEWCASTLE.

PURCHASE OF NEW CARS.

Newcastle Tramways Corporation Committee propose to acquire twenty new cars.

PONTYPRIDD.

RUNAWAY CAR.

A loaded car with passengers got out of control at Pontypridd on March 22, and ran through the town at a speed estimated at 40 miles an hour. The car, which was of the top deck type, was in charge of an experienced driver, and was fully loaded with passengers. After starting on the down gradient the brakes apparently failed to act, owing, it is said, to the greasy condition of the rails. The street was congested with pedestrians and vehicular traffic, and near a bend of the road the car collided with a lorry, which swung round and seriously injured a girl. The lorry was hurled against an electric standard, which snapped off. After this check the car gained speed, and crossing the river bridge encountered two other vehicles, which were damaged. The car ran off the line at the points, and was then brought to a stop, the driver having stuck to his post the whole of the distance. The passengers escaped unharmed.

SOUTHPORT.

TRAMWAY EXTENSIONS—TOAST RACK CARS.

The Tramways Committee has recommended that application be made for power to raise a loan of £41,000 for the purchase of the Southport Tramways Company's undertaking, extensions of Canning Road depot, the purchase of three toast-rack cars, etc.

SOUTHEND.

EXTENSION AUTHORISED.

The Light Railway Commissioners have granted an order to the Southend Corporation for the construction of a tramway loop at Warrior Square.

TEES-SIDE.

TRAMWAY BOARD REJECTED.

Middlesbrough Corporation has declined to accede to the proposal, of which the Stockton and Thornaby Corporations were in favour, to form a joint Board for the control of the Tees-side tramways, which are shortly to be taken over from the Imperial Tramways Company by the three municipalities. Commenting on the refusal, the *North Star* remarks that the Corporation seems to imagine it has quite a separate identity. Some method of joint control must certainly be arranged by mutual consent if the tramways are to be worked smoothly and successfully, and local conditions demand joint management of the transport undertakings.

TORQUAY.

COST OF ELECTRICITY.

The hearing of the adjourned summons issued by the Torquay Corporation against the Torquay Tramways Company to revoke the existing contract with the latter fixing the price paid by them for current was heard before Master Chitty in chambers on March 12. After some discussion of the legal aspects of the case, the parties came to an arrangement which is reported to be satisfactory to both.

YORK.

CLUB FOR TRAMWAY EMPLOYEES.

The employees of the City of York Tramways, through their recreation club, have purchased Phœnix House, Fishergate, for use as a club. The house was offered for sale by auction, and was bought for £1,500. Arrangements for the use of the house are not yet completed, but it is expected that it will be run on lines similar to working men's clubs. The men will be able to obtain meals at the club, and to spend their leisure time there.

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CONTRACTS AND ORDERS.

The General Electric Company are to supply 1,000 KW. of converting plant to Ilford Urban Council.

Stirling Boiler Company has received an order from Aberdeen Corporation for two boilers at £41,000.

The Equipment and Engineering Company are supplying a motor generator set to Plymouth Tramways Committee for electric arc welding at £933.

William Griffiths and Company, Limited, are the successful tenderers for the reconstruction of tramway permanent way for Bournemouth Corporation at £139,230.

The English Electric Company, Limited, have received an order from Plymouth Tramways Committee at £654 per set for electrical equipments for twelve cars.

Bd. Bennis and Company's tender has been accepted by Swansea Electricity Committee for an elevator capable of raising 20,000 tons of coal per hour with delivery to a chain conveyor.

Plymouth Tramways Committee at their last meeting considered tenders for the supply of omnibus bodies and chassis, but a decision was deferred pending a report by the manager after an inspection of various types of vehicles offered.

Glasgow Town Council have accepted tenders from Messrs. William Little and Sons for fifty pressed steel gear cases, from the English Electric Company, Limited, for forgings for car trucks, and from the British Insulated and Helsby Cables, Limited, for trolley cable.

Scholey and Company, Limited, of 56, Victoria Street, S.W., contractors for Messrs. C. P. Sandberg, have received an order from Reading Corporation Tramways for the treatment of two miles of single track and from the South Shields Corporation tramways for one mile of single track by the Sandberg "insitu" rail hardening process.

Glasgow Tramways Committee have received the following tenders for special track work, viz.:—United States Steel Products Company, £11,291; Hadfields, Limited, Sheffield, £11,505; Edgar Allen and Company, Limited, Sheffield, £11,590. After some discussion it was decided by 10 votes to 4 to divide the contract between the two Sheffield firms.

New Edinburgh Corporation Omnibuses.—The Associated Equipment Company, of Walthamstow, London, E., have received an order from the Edinburgh Corporation through their Scottish Agents for 30 saloon body, single deck omnibuses, fitted with electric lighting sets. The chassis of these vehicles will be of the 45 H.P. standard A.E.C. type.

The Peckham Truck and Engineering Company, Limited, of 10, Coleman Street, London, E.C.2, have recently received the following orders for "Pendulum" trucks—Newcastle 23, Plymouth 12, Sheffield 37. They have also received the following orders for the "Thomas" non-automatic brake adjuster—Newcastle 20, Ilford 16, Plymouth 12, Dublin 1, Belfast 1.

New Rolling Stock for Burnley.—The Burnley Council has accepted the tender of the English Electric Company for bodies for five single deck cars and for five electrical equipments from the British Thomson-Houston Company. The bodies will cost £1,350 each, the electrical equipments, £936 10s., and the trucks, which will be made by the Corporation, will cost £1,060 each.

York Corporation received six tenders, ranging from £52,331 to £107,388, for the erection of a hydro-electric power house at Linton Locks. The lowest tender, made jointly by Vickers, Ltd. and Timothy Patrick, was accepted. It provides for high velocity turbines, and is subject to the electrical engineer (Mr. J. W. Hame) obtaining satisfactory guarantees of their efficiency and power.

More Omnibuses for Edinburgh.—Edinburgh Tramways Committee recommend the reconstruction of the depots at Portobello and Shrubhill at a cost of between £25,000 and £30,000. They recommend also the acceptance of tenders for twenty-four omnibuses, twelve from Messrs Leyland Motors, Limited, at £600 each, and twelve from Messrs. Cowieson, of Glasgow, at £660 each, and that the Mound route be the first of the tramway routes to be worked

Southend Tramways Committee have received from the general Manager and Engineer (Mr. R. Birkett), tenders obtained by him for the supply of the steel tires required for the driving and pony wheels on the tramcars for the ensuing twelve months, and reported that the tender of Messrs. John Brown and Company of Sheffield, for the supply of 200 driving wheel tires, and 60 pony wheel tires, at prices amounting to £1,225, was subject to immediate acceptance. He was accordingly authorised to notify Messrs. Brown of the acceptance of this tender.

The General Vehicle Company, Limited, have delivered an electric vehicle to the Birkenhead Corporation Electricity department. The chassis is of one ton capacity, and has a length of 12 ft. and a width of 6 ft. The vehicle has a removable canvas top, and it can be used either open or closed. It is equipped with an iron-clad battery, manufactured by the Chloride Electrical Storage Company, Limited, and is designed to enable a journey of 40 miles to be made on an average thoroughfare at a speed of 14 miles per hour.

PATENT LIST

Abstracted for "The Tramway and Railway World" from the Official Journal of Patents.

***** If the inventions have been communicated the names of the communicators are given in italics.**

APPLICATIONS FOR LETTERS PATENT.

The number of the patent is given in brackets.

Bodies for commercial motor vehicles (4,359)—T. H. Hutchins.
Honeycomb radiators for motor vehicles (4,418)—F. H. Jackson and E. J. Symcox.
Welding rails (3,920)—C. F. Jacobs.
Means for supply of electric current to tracks (4,104)—W. T. Jones.
Driving wheels for motor vehicles (4,075)—H. Lanz.
Lifeguards or obstruction removers for motor vehicles (4,504)—M. J. Leary.
Motor vehicles (4,368)—G. M. Lebeau.
Trolley wheel head and bearing socket of electric traction equipment (4,417)—J. K. Malone.
Steering gear for mechanically-propelled vehicles (4,482 and 4,483)—H. Marles and Marles Steering Company.
Wheels and tires for motor vehicles (4,484)—H. Marles.
Driving mechanism for automobiles (4,233)—M. H. Millett.
Motor vehicles (4,564)—J. Nichol.
Variable speed gear for motor vehicles (4,443)—T. Orr.
Motor vehicles (4,474)—F. T. Reilly.
Tramrails (4,010)—W. J. Sells.
Motor vehicles (4,481)—L. de S. Victorio.
Pendant supports for railway coaches and public vehicles (4,203)—P. R. J. Willis (*A. T. Johnson*).
Spring for tramcars, motor cars, rolling stock, etc. (4,425)—H. G. Wilson.
Automatically operated traffic signalling devices, etc. (4,449)—D. H. F. Wyley.
Device for driving motor vehicles (4,472)—V. Zboril.
Journal bearings for axles of tramway and railway vehicles (5,236)—C. E. Adams.
Motor vehicles (5,110)—F. C. Blake.
Signalling systems (5,172)—British Thomson-Houston Company (*General Electric Company*).
Seats for motor vehicles (4,618)—O. J. Critchard and Charlesworth Bodies, Limited.
Mechanism for operating brakes of vehicles (5,268)—A. Dickinson.
Motor vehicles (4,617)—L. Dugdale.
Tramway and railway rails or tracks (4,607)—E. M. Forrister.
Dynamos for lighting and starting devices upon motor vehicles (5,097)—J. R. P. E. F. M. Grimaud.
Life guard for automobiles, etc. (5,108)—H. H. Hancock.
Tipping bodies for motor vehicles (4,993)—E. T. H. Jones.
Motor vehicles (4,796)—G. Lambert.
Transmission arrangements in motor vehicles (4,797)—G. Lambert.
Starting apparatus for motor vehicles (4,798)—G. Lambert.
Motor vehicles (5,309)—H. P. Martin.
Traffic indicator (4,951)—E. Meldal.
Speed changing and reversing gear for motor vehicles (5,112)—R. Pickett.
Electric engine stop signal (4,934)—G. Taylor.
Control mechanism for electric cars with pneumatic brakes (4,950)—Westinghouse Electric and Manufacturing Company.
Sleeper for rails of tramways and light railways (5,733)—J. Barrett and H. Davies.
Motor vehicle wheels (6,020)—E. W. Bowen.
Driving and transmission gear for motor vehicles (6,021 and 6,022)—E. W. Bowen.
Lifting jacks (5,462)—A. W. Chapman.
Change speed and reversing gears for motor vehicles (5,992)—H. V. Cordier and G. M. Lebeau.
Devices for jacking up motor vehicles (5,567)—A. Delo-Ford.
Self-propelled road vehicles (6,075)—B. D. Fox.
Safety controlling gear for electrically propelled vehicles (5,942)—R. Garrett and Sons and H. R. Simpson.
Safety starter for motor vehicles (6,066)—H. W. Hayward.
Motor vehicles (5,542)—J. J. Mayrow.
Brake mechanism for electrically propelled vehicles (5,748)—P. A. H. Mossay, Mossay and Company, and Ransomes, Sims and Jeffries.
Electric controllers for electrically propelled vehicles (5,749)—P. A. H. Mossay, Mossay and Company, and Ransomes, Sims and Jeffries.
Motor vehicles (5,954)—G. H. Newton.
Motor vehicles (5,972)—R. E. Nolan.
Change speed gearing for motor vehicles (5,631)—W. M. Oddie.
Tramway rails (5,852)—K. Olsen.
Permanent way (5,498)—W. Oswin.
Life-guards for road vehicles (5,452)—F. H. Sycamore.
Life-guard for tramcars, etc. (5,336)—H. Turner.
Fenders for motor vehicles (5,825)—H. R. Vogler.

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Change speed gear for motor vehicles (5,768)—P. Wigley.
Electric trackless tramcars, etc. (6,117)—G. A. Bishop and R. A. Chadwick.
Passenger vehicles (6,918)—S. Gage and London General Omnibus Company.
Starting mechanism for motor vehicle engines (6,365)—H. W. F. Ireland and H. Lucas.
Starting devices of mechanically propelled vehicles (6,466)—D. J. Leins.
Radiators for motor vehicles, etc. (6,296)—G. E. Pugh and W. B. Shepherd.
Motor vehicles (6,873)—A. M. Rowland.
Tramcars, etc. (6,143)—H. Smith.
Lifting jacks (6,861)—W. S. Wilkins.
Passenger vehicle stage indicators (7,549)—S. Barlow.
Mechanically propelled vehicles (7,350)—W. T. Bell and F. J. Bretherton.
Motor vehicles (6,987)—A. J. Benbow.
Guiding devices for trollies of electric tramway vehicles (7,199)—R. N. Bradley and A. E. Millington.
Motor vehicles (7,571)—A. G. Grice.
Life-guard for vehicles (7,466)—L. L. Grose.
Omnibuses (7,303)—W. J. Hickman.
Lifting jacks (7,174)—D. T. Jones.
Front wheel guard for motor omnibuses, etc. (7,472)—P. C. Lowman.
Brake blocks and holders therefor (7,419)—A. Ogden.
Short turning gear for motor vehicles (7,615)—J. W. Bennett.
Reinforcement for rear springs for taking up torque and braking stresses (8,039)—Birmingham and Midland Motor Omnibus Company and L. G. W. Shire.
Car truck (7,692)—Commonwealth Steel Company.
Motor vehicle warning, starting and braking arrangements (8,280)—D. H. O. Edmunds.
Vehicle route indicator (7,890)—J. Ellis.
Automatic automobile jacks (8,265)—L. M. Fisher.
Slatted floors, decks, etc. (8,267)—London General Omnibus Company and S. Gage.
Motor vehicles (7,759)—A. Good.
Lifting jacks (7,859)—G. E. Harris and W. Harris.
Lifting jacks (7,881)—C. F. L. King.
Tramway points (8,089)—M. Landman and A. G. Williams.
Lifting jack (8,056)—Middletown Car Company (*Iron City Products Company*).
Motor vehicles (8,266)—J. G. Owen.
Friction drive and variable speed mechanism for motor vehicles (7,601)—W. Smith.
Draw gear for tramway vehicles (7,816)—A. N. Thorpe.
Rail joints (8,312)—R. G. Washington.
Starting mechanism for motor vehicles (9,045)—C. L. Breeden, H. W. F. Ireland, and H. Lucas.
Electric locomotives (8,919)—British Thomson-Houston Company and F. W. Carter.

SPECIFICATIONS PUBLISHED.

1918.

Speed indicators (4,121—*138,373*)—C. J. H. Mackenzie-Kennedy.
Transmission gearing for motor vehicles (20,093—*121,289*)—M. A. Delque and C. M. Motte.

1919.

Trolley heads for electric tramways (2,212—*138,160*)—A. Bannister and T. W. Tucker.
Friction driving gear for motor vehicles (3,424—*138,429*)—R. Blakoe.
Means for connecting span wires and fittings for the suspension of trolley wires for overhead electric traction (4,196—*138,441*)—Brecknell, Munro and Rogers and A. M. Willis.
Construction of apparatus for signalling direction of travel and stopping on road vehicles (5,807—*138,458*)—H. L. Zeitun and M. H. Moore.
Transmission gear and bracket for the magnetos of motor vehicles (6,001—*138,460*)—T. R. R. Chilcott.
Mechanically propelled road vehicles (10,862—*138,511*)—J. H. Sinclair.
Differential gearing for motor vehicles (20,866—*138,561*)—M. Walter.
Change speed gearing for motor vehicles (24,381—*138,575*)—A. Ramsay and A. Mort.
Mechanism for steering motor vehicles (7,158—*138,748*)—W. Pugh.
Motor vehicles (11,755—*138,787*)—F. L. Freeman.
Means for automatically signalling when a vehicle passes over a predetermined point in a road (12,658—*138,792*)—E. Badger.
Springing of motor vehicles (15,207—*138,804*)—A. J. Adams.
Rails (15,670—*128,587*)—A. F. Eoll.
Operating and locking mechanism for points and switches of tramways (16,395—*138,806*)—P. Clewes.
Spring systems for motor vehicles (7,477—*139,324*)—Waverley Cars, Limited, and A. A. Watkins.
Direction indicators for road vehicles (13,578—*139,379*)—E. G. Archer.
Axles for motor vehicles (16,582—*139,394*)—W. H. Hingston.
Station or stopping point indicators for public vehicles (1,023—*139,255*)—P. H. Waller and B. E. Nordman.

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TRAFFIC RETURNS.

Tramway and Omnibus Undertakings in the United Kingdom.

NAME OF COMPANY OR CORPORATION.	1919. WEEKS ENDED					1920. WEEKS ENDED.					AGGREGATE.		
	Mar. 7	Mar. 14	Mar. 21	Mar. 28		Mar. 6	Mar. 13	Mar. 20	Mar. 27		Wks.	1920.	Increase or Decrease.
	£	£	£	£	£	£	£	£	£	£		£	£
Aberdare U.D. Council	502	501	516	489	...	597	594	599	629	...	51	28,993	+ 3,013
Aberdeen Corporation	2,551	2,497	2,578	2,546	...	3,063	2,987	2,989	3,097	...	42½	137,537	+ 26,435
Ayr Corporation	394	419	424	422	...	468	466	494	496	...	45	30,693	+ 4,793
Barrow Corporation	600	617	615	645	...	716	700	735	808	...	12¾	8,934	+ 1,411
Belfast City Tramways	7,888	8,386	8,765	8,581	...	11,040	10,620	10,938	10,910	...	52	539,115	+ 136,160
Birkenhead Corporation	2,166	2,216	2,159	2,243	...	3,029	2,986	3,062	3,101	...	46½	152,362	+ 39,133
Birmingham Corporation	24,159	24,331	24,033	24,489	...	27,073	26,265	26,743	27,852	...	52	1,354,696	+ 120,584
Birmingham Motor 'Buses	1,298	1,326	1,254	1,315	...	2,328	1,646	1,805	1,927	...	52	90,368	+ 16,776
Blackburn Corporation	1,773	1,744	1,870	1,881	...	2,093	2,007	2,184	2,257	...	52	116,964	+ 25,221
Bradford Corporation	9,369	9,946	9,325	9,601	...	11,483	11,646	11,526	11,986	...	52	592,618	+ 110,449
Burnley Corporation	2,628	2,715	2,769	2,729	...	3,013	2,895	2,693	2,691	...	—	—	—
Burton-on-Trent Corporation ...	402	414	432	405	...	507	507	516	524	...	52	26,579	+ 5,090
Bury Corporation	2,105	2,068	1,966	1,962	...	2,418	2,293	2,530	2,370	...	51½	121,879	+ 16,040
Chatham and District	1,236	1,291	1,273	1,246	...	1,477	1,391	1,389	1,525	...	12	17,322	+ 2,606
Cork Electric	473	518	578	501	...	815	761	791	716	...	12	9,377	+ 2,901
Derby Corporation	1,434	1,455	1,439	1,449	...	2,057	1,911	1 990	2.078	...	52	101,381	+ 23,995
Dundee City	1,998	2,018	2.064	2.024	...	2.504	2,493	2,427	2,555	...	44½	113,690	+ 25,630
East Ham Corporation	1.540	1,653	1,706	1,673	...	1,693	1,688	1,689	1,742	...	51½	97,157	: 15,961
Edinburgh Corporation	8.153	8.540	8,401	8,698	...	11,120	10.635	10.891	11,240	...	38½	424,284	+ 81,708
Glasgow Corporation...	27,916	29,459	29,113	29,789	...	33,774	32,893	33,565	34,173	...	43½	1,400,157	+ 175,889
Glossop (Urban Elec. Supply Co.)...	234	223	224	208	...	224	220	234	240	...	13	2,930	+ 168
Huddersfield Corporation	3,541	3.602	3,657	3,796	...	5,156	4.717	4,838	5,136	...	52	253,122	+ 58,197
Ilford U.D. Council	1,053	1,062	1,043	1.048	...	1,157	1,151	1,134	1,181	...	51½	61,170	+ 9,052
Ipswich Corporation	676	670	635	632	...	826	784	818	862	...	52	46,908	+ 8,855
Isle of Thanet	311	350	380	344	...	567	542	536	653	...	25½	13,534	+ 5,636
Kilmarnock Corporation	263	269	265	264	...	309	312	311	313	...	45¾	13,370	+ 1,227
Lanarkshire	3.423	3.542	3.706	3.577	...	3.890	3.857	3,903	4,092	...	12	47,503	+ 2,937
Leeds City	14.061	14.082	14,312	14.381	...	16,584	15,788	16,157	16.629	...	52	854.052	+ 152.617
Leicester Corporation	5.068	5.096	5.175	5.149	...	4.892	4.933	5.843	6.093	...	—	—	—
Leyton U.D. Council...	2,632	2.413	2.660	2,636	...	2,632	2,558	2.523	2,848	...	52	155,352	+ 36,054
Liverpool Corporation	20,823	21.069	20.820	21.699	...	25.914	25.229	26,142	27.402	...	12¾	319,383	+ 69,620
London County Council	68,631	69.972	70.877	71.092	...	77.930	77.898	76.888	81.834	...	51¾	4.076.457	+ 658,092
Maidstone Corporation	278	286	279	274	...	367	348	345	387	...	51½	19,740	+ 5.089
Manchester Corporation	26,953	27.481	27.618	27,651	...	30.941	29.446	31.105	31,082	...	52	1.575.197	+ 221.329
Newcastle-on-Tyne Corporation ...	8,337	8,296	8.490	8,476	...	9,420	8,932	9,200	9,355	...	51	486,659	+ 30,860
Northampton Corporation	...	...	...	...	...	...	...	...	...	...	—	—	—
Nottingham Corporation	6.406	6.478	6.617	6.611	...	7.244	7.177	7.239	7.548	...	52	371,390	+ 68,206
Oldham Corporation	3,612	3.701	3.583	3.608	...	4,484	4.518	4.896	4.729	...	52	235,633	+ 51,665
Reading Corporation...	1,350	1,390	1.329	1,339	...	1,730	1,678	1,706	1.806	...	51	83.791	+ 16,672
Rotherham Corporation	2,054	2,060	2.030	1,997	...	2,406	2,395	2,418	2,515	...	50¾	111.466	− 4.429
St. Helens Corporation	...	...	...	...	...	1,775	1,728	1,744	1,873	...	25	40,769	—
Sheffield Corporation	15,528	15,979	15,873	16.072	...	19,521	19,388	19,989	20,315	...	52½	896,189	+ 200,048
Southampton Corporation	2,421	2,472	2,462	2,407	...	3,049	2.895	2,814	3.118	...	51¾	143,934	+ 15,082
Southampton Motor 'Buses ...	...	...	...	...	...	203	189	175	214	...	33	5,306	—
Southend Corporation	1,167	1,184	1,145	1,213	...	1,454	1,469	1,435	1,608	...	51	162,161	+ 35,390
South Shields Corporation	1,215	1,204	1,230	1,234	...	1,489	1,431	1,453	1,492	...	52	74,339	+ 14,653
Sunderland Corporation	2,715	2,793	2,756	2,694	...	2,804	2,754	2,883	2,885	...	52	147,835	+ 30,246
Swindon Corporation	291	288	291	264	...	329	329	318	358	...	51¾	18,412	+ 2,751
Tyneside Tramways and Tramroads	847	843	896	...	...	1,044	1,020	996	...	...	11	10,970	+ 1,781
Wallasey Corporation	1,992	2,029	2.024	2,040	...	2,294	2,179	2,314	2,361	...	51½	127,315	+ 29,242
Walsall Corporation	1,283	1,297	1,265	1,309	...	1,630	1,572	1,592	1,644	...	51	79,272	+ 14,646
Walthamstow U.D. Council ...	1,465	1,463	1,428	1,444	...	1,815	1,786	1,801	2,019	...	52	89,863	+ 15,832
Warrington Corporation	823	879	851	832	...	973	953	967	966	...	51	47,028	+ 6,355
West Ham Corporation	4,731	4,872	4,888	4,813	...	5,183	5,115	5,108	5,437	...	51¾	273,068	+ 35,103
Wolverhampton Corporation ...	1,796	1,677	1,750	1,703	...	2,335	2,249	2,200	2,376	...	51	108,606	+ 21,027

Colonial and Foreign Tramway Traffic Returns.

NAME OF COMPANY.	1919. WEEKS ENDED.					1920. WEEKS ENDED					AGGREGATE.		
	Mar. 7	Mar. 14	Mar. 21	Mar. 28		Mar. 6	Mar. 13	Mar. 20	Mar. 27		Wks.	1920.	Increase or Decrease.
	£	£	£	£	£	£	£	£	£	£		£	£
Anglo-Argentine	58,381	60,757	64,218	62,116	...	88,165	75,786	72,773	75,785	...	12	870,121	+ 195,662
Calcutta ... ... Rs.	77,668	89,155	84,052	81,802	...	81,422	88,550	88,482	89,222	...	12½	1,126,101	+ 60,790
Madras ... ... Rs.	...	30,304	(2 weeks)	...	...	...	49,949	(2 weeks)	...	...	10	216,803	+ 19,890
Pernambuco	5,686	5,275	5,281	5,563	...	8,100	7,784	8,078	6,910	...	12½	101,475	+ 33,753

Companies Issuing Monthly Statements only.

	1918.			1919.			1919.			1920.			Wks.	AGGREGATE.	
	Oct.	Nov.	Dec	Jan.	Feb.	Mar.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.		1919-20.	+ or −.
	£	£	£	£	£	£	£	£	£	£	£	£		£	£
Ballarat & Bendigo	3,570	3,884	4,504	3,603	...	...	4,243	4,219	5,119	4,250	...	...	44	41,394	+ 2,311
Brazilian Trac. Mlts	8052000	7581000	8531000	8522000	7972000	...	9980000	9796000	9739000	9655000	9381000	...	8	19036000	+ 2542000
Brisbane	...	...	...	38,575	34,380	...	...	...	...	44,800	41,600	...	8	86,400	+ 13,445
British Columbia $	580,354	612,893	591,065	677,489	645,415	...	710,405	733,981	783,324	828,709	746,030	...	34	5,796,655	+ 1,055,656
Buenos Ayres L'c'z.	41.843	42,952	50,460	41,556	42,429	470,370	49,692	50,635	55,873	52,642	52,468	55,000	39	453,687	+ 63.108
Burma	34,848	34,408	34,593	38,265	35,926	...	51,898	46,755	43,571	41,749	41,814	...	30	312,622	+ 61,891
Cape Town ...	...	...	...	...	...	...	...	...	...	26.009	20,623	...	—	—	—
Carthagena & H. ...	2,525	2,988	2,950	3,655	2,351	2,400	1,465	2,549	2,923	4,748	4,008	3,493	13	12,249	+ 3,843
East India ...	2,044	1,942	2,048	1,970	1,689	2,016	2,855	2,709	2,916	2,988	3,001	3,592	35	23,653	+ 8.025
Kalgoorlie	2.835	2,933	...	...	...	...	3.095	2,859	...	...	...	...	48	30,492	− 346
La Plata	5,177	5.334	5,792	5,730	...	...	6,196	6,240	6,324	3,155	...	...	4	3,155	− 2,575
Lima	...	44,910	...	...	...	...	...	52,086	...	...	...	...	48	531,788	+ 51,653
Manila ... $	214,898	214,292	236,612	231,586	...	...	241,949	247,599	276,000	278,338	...	...	4	278,338	+ 46,752
Monte Video ...	...	...	...	40.910	...	...	...	...	...	47,767	...	...	13	132,450	+ 21,401
Para	22,442	19,765	23,800	24,515	23,248	...	27,849	25,422	24,412	24,306	24,303	...	13	73,021	+ 1,458
Peruvian ... $	...	...	1057990	...	...	...	...	...	1310880	...	...	...	—	—	—
Port Elizabeth ...	...	...	...	...	...	...	...	...	...	7,827	6,166	...	—	—	—
Rangoon	6,566	6,611	6,188	6,373	5.694	7,533	7,679	7,379	5,717	7,467	7,667	8,698	13	23,832	+ 3,787
Toronto ... $	1048478	1071106	...	1106840	1015797	...	1123801	1111177	...	1130486	1113717	...	8	2,244,203	+ 121,566
Winnipeg ... $	295,005	260,601	...	390,539	371,162	...	428,339	423,826	...	498,837	444,873	...	8	945,71	+ 82,009

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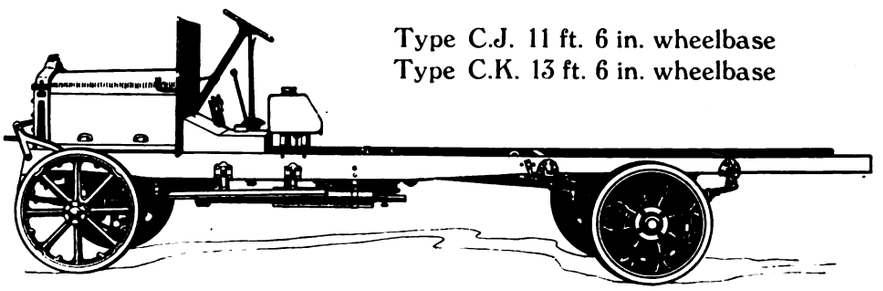
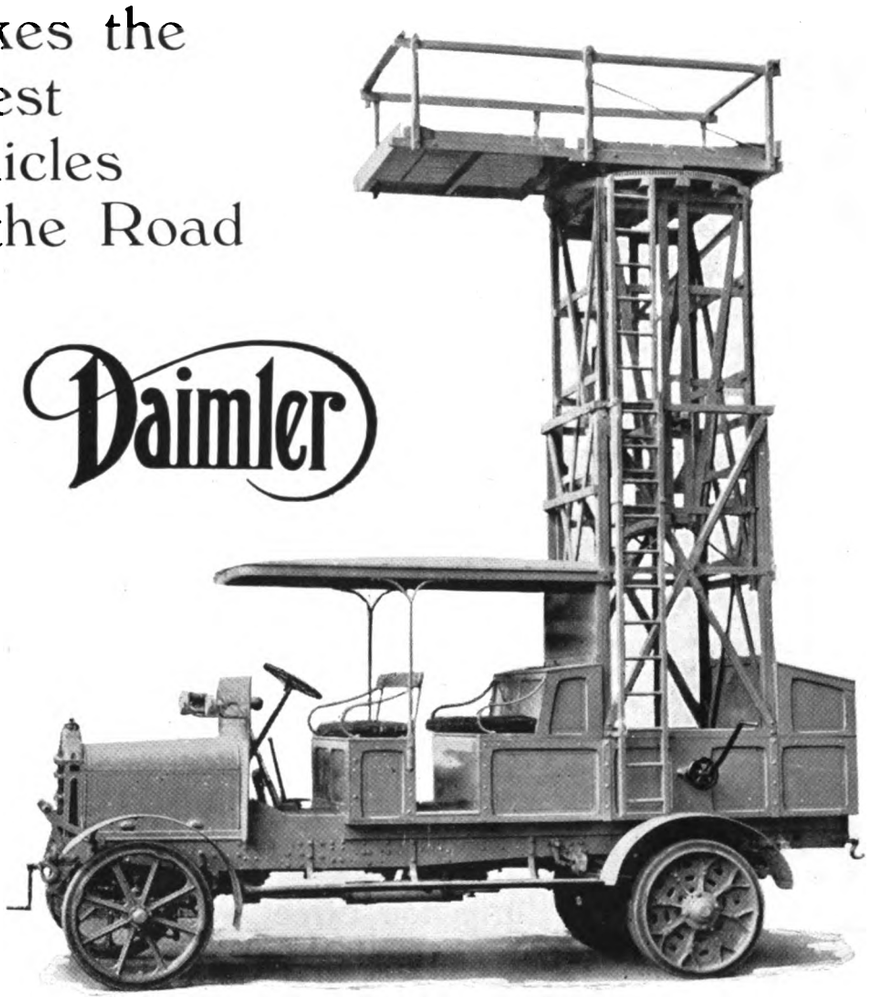
The Daimler 2-3 ton Chassis



Type C.J. 11 ft. 6 in. wheelbase
Type C.K. 13 ft. 6 in. wheelbase

Makes the
Finest
Vehicles
on the Road



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The Daimler Company Ltd. Coventry

12

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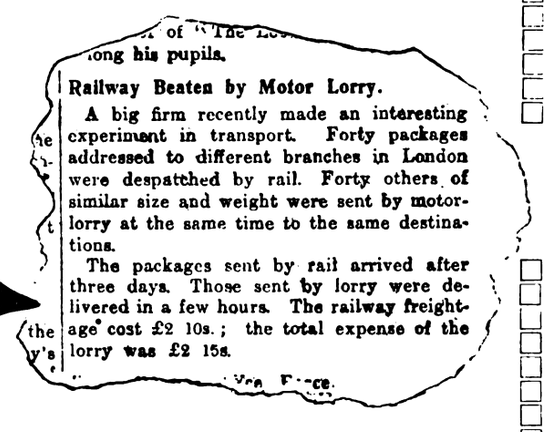
...long his pupils.

Railway Beaten by Motor Lorry.

A big firm recently made an interesting experiment in transport. Forty packages addressed to different branches in London were despatched by rail. Forty others of similar size and weight were sent by motor-lorry at the same time to the same destinations.

The packages sent by rail arrived after three days. Those sent by lorry were delivered in a few hours. The railway freightage cost £2 10s.; the total expense of the lorry was £2 15s.

The Business Vehicle referred to above delivered 40 packages at a saving of 2½ days over the Railway. This saving can be made on every journey made by a Napier Business Vehicle.

Are you losing this time? The NAPIER Two Ton B.V. is of PROVED RELIABILITY. The repeat orders we receive PROVE its EFFICIENCY, and we can show you figures—compiled by actual users—which PROVE how ECONOMICAL it is to run.

Please write for particulars TO-DAY.

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THE MOTOR COACHING SEASON.

In our last issue we referred to several interesting developments of motor coach services inaugurated by Corporations, tramway companies, and others. The motor coaching season has now definitely commenced, and a very rapid increase in the number of vehicles of this type in service is to be anticipated. Probably progress will be less hindered in this direction than in others by increased costs of operation. Fares are not regulated by direct and acute competition with other methods of conveyance. The motor coach is mainly a holiday vehicle, and people on holiday do not grudge exceptional expenditure then incurred in the same way as they would grudge additional expenditure on their daily conveyance to and from business. It has been noted that only few Corporation tramway undertakings operate vehicles of the motor coach type. There are often serious difficulties in the way of doing so. The powers obtained may not permit of the running of vehicles outside the area governed by the Corporation. It may, moreover, be felt that, the services not being essential, the business is not one in which a Corporation is justified in competing with the private enterprise of individual citizens. In places in which motor coaches are run entirely by private enterprise there still remains the need for a certain measure of local government control. Well organised motor coach services can be made a valuable asset to any locality, and particularly to seaside and other holiday resorts. The vehicles will cease, however, to be an asset if they are undependable and unattractive. Care should be taken to ensure that licenses do not continue to be granted in respect of unreliable vehicles. Somewhat strict supervision in this respect is in the interests of the motor coach proprietors themselves, since one serious accident might, quite unjustifiably, frighten people away from all the local services even though the accident is due to the inefficiency of only one coach proprietor and his vehicles. The local authority can easily refuse permission to stand or ply for hire in respect of vehicles of inferior quality or those the proprietors of which have no proper organisation for repair and maintenance. A refusal or withdrawal of such permission is a great handicap as against competitors to whom the permission is granted, and thus the controlling power of the local authority is considerable. The licensing authority should insist that all vehicles plying for hire shall offer good accommodation to passengers, shall be kept clean, shall be properly equipped, and shall operate punctually in accordance with time table. Touting for custom should be strictly prohibited. In districts where these precautions are taken it is found that a good class of motor coach business develops rapidly. Where such preparations are neglected the business develops much more slowly and on far less satisfactory lines. Only a poor class of custom is attracted, and the running of the trips is correspondingly unprofitable.

TAXATION OF MOTOR OMNIBUSES.

It is high time that the liabilities of motor omnibus proprietors in respect of taxation, both national and local, should be clearly defined. In the forecasts of the new national scheme of motor taxation the probability is indicated that the motor omnibus will be far more heavily taxed than the goods carrying motor vehicle. It is reasonable that this should be so, because on the average the mileage covered is much higher in the case of the omnibus. There is, of course, still some hope at the time of writing that the proposed scale of taxation will be modified and certain reductions made. The main point is, however, that even when the contribution to the national exchequer has been determined, there remain other possible but undetermined liabilities in respect of local taxation. Sir Henry Maybury recently stated that in the opinion of the Ministry of Transport the maximum contribution that motor omnibuses should be called upon to pay towards the maintenance of the roads actually used by them should be three-halfpence per omnibus mile. The danger of stating a maximum is that the sum suggested may come to be regarded not as the maximum but as the normal figure properly payable in every case in which new omnibus services are instituted. There appears to be no logical reason why, if the motor omnibus proprietor makes an adequate contribution towards the maintenance of all the roads he uses, he should make a further contribution towards the improvement of roads which he does not use. The taxation of motor omnibuses should either be local or national, but not both. There is a possible exception to be found in certain instances. We may agree that the annual contribution should be to a national fund, and that the authority responsible for the maintenance of the roads on which the omnibus runs should obtain assistance from that fund, and not direct from the omnibus proprietor. Now it may be proposed to start a service on a purely local road not likely to be classified by the Ministry of Transport either as a first or second class highway. In that case no contribution

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MOTOR TRAFFIC

would go to the local authority from the central authority in respect of that particular road. Moreover, the road being probably not much more than a lane, would also probably not be properly constructed from the foundations upwards, having been built merely for the use of farm carts and light horsed vehicles. In such a case the regular passage of motor omnibuses might do a considerable amount of injury for which the local authority could get no easy redress, except by some special arrangement. The official view is that in such cases provision should be made for a payment in the first instance for the purpose of adaptation of the road to its new use, and that this payment should not exceed a maximum of £700 per mile of road used by the motor omnibuses. Thus, as things stand we have the possibility of three totally distinct payments, one to the national fund and two to local funds, the assessment under each one of the three being unknown. Anyone proposing to inaugurate a new service finds it difficult to estimate his probable liabilities and costs. This is an undesirable state of affairs, because very many new services are required, particularly between business centres and the small residential districts surrounding them. A state of uncertainty hinders the organisation of such services, and therefore tends to prolong the period of inadequate traffic facilities through which we are passing.

THE USE OF RUBBER TIRES.

It is to be hoped that the new system of employing Advisory Expert Committees to assist Government departments in the preparation of legislation may have the effect of making road vehicle law in the future more logical and helpful than it has been in the past. Thus for the time being we have the absurd regulation that no commercial vehicle may draw a trailer at a speed higher than five miles an hour. If the advice of competent authorities be taken, it is safe enough to prophesy that this speed limit will be substantially increased, at any rate providing that the power vehicle and the trailer both have their wheels shod with rubber tires. It is possible also that the legal differentiation which now exists between the rubber-tired and the metal-tired motor vehicle will be further accentuated. This in our opinion would be a step in the right direction. We should be sorry to see anything done which would have the effect of driving the steam tractor off the road. For certain purposes this is a very valuable type, but with this one exception everything appears to favour the exclusive employment of rubber-tired machines for road work. This, of course, involves substantial expenditure on tire maintenance, though it is to some degree balanced by the saving in the maintenance of mechanism due to the protection against shock and vibration afforded by the tires. From the national standpoint it is also strongly counterbalanced by the reduced wear on the road by a vehicle of given weight and given speed. The law should be so framed as to serve the national interest, which is all in favour of good roads and efficient transport. We should therefore encourage any system which enables higher speeds and therefore higher efficiency, and higher individual output to be obtained without increased wear and tear of the highways. One might, perhaps, go so far as to suggest that it would be similarly advisable, in respect of the lighter classes of industrial and public service vehicle, to encourage pneumatic as opposed to solid tires. In neighbouring continental countries pneumatics are far more extensively used than they are here on motor vans and the lighter classes of motor omnibus. It is seldom that one sees in England a trade vehicle with large twin pneumatics on the back wheels. In France it is a comparatively common sight.

SMALL MOTOR OMNIBUSES.

One wonders whether there is not some scope in this country for the comparatively small pneumatic tired motor omnibus mentioned above. Naturally when vehicles of this type are used the costs of operation per passenger mile are considerably higher than for the London type of motor omnibus. There are very many places in which the volume of custom obtainable is not sufficient to justify the use of vehicles of large capacity. Moreover, the smaller vehicles can safely maintain a considerably higher average speed. Thus we have between them and the ordinary motor omnibus a comparison rather similar to that which exists between the motor omnibus and the tramcar. The smaller the vehicle the more possible is it to run a reasonably frequent service even upon a lightly patronised route, and the better the frequency the more likely is traffic to be developed up to a really remunerative position. Again, the more speedy vehicle can get custom at higher fares, and the pneumatic tires are certainly conducive to greater comfort than is otherwise obtainable, particularly, perhaps, on certain kinds of country road. Further, there are many such roads where, owing to sharp corners, steep hills, overhanging trees, and low bridges, the use of a vehicle of the double-decked type or of one of very long wheelbase is not to be recommended.

PNEUMATIC-TIRED TRUCKS.

The fitting of pneumatic tires on trucks of 2-ton capacity and over was a feature of the recent Chicago Truck Show. Out of 244 chassis exhibited, 119 were shown on pneumatic tires. The largest pneumatic was a 48 by 12 inch Goodyear shown on a 5-ton vehicle. One of the most noticeable exhibits was the Packard 3-ton truck, designed for use on pneumatics. This truck is fitted with an engine usually mounted on the Packard 5-ton truck. In trials which the Packard Company made, it was shown that greater engine power was needed in order to make possible the greater vehicle speed when pneumatics are employed.

The *Commercial Vehicle* (New York) remarks that fleet owners must bear in mind that the pneumatic tire is not a cure-all for all transportation evils. The pneumatic tires give a better service which in many cases costs more than a poorer service on solid tires. There is much still to be done in the design of vehicles for pneumatic tires. Along with the engines of larger horse power, there must come an increase in the engine speed, or a change in the gear ratios to effect the same result. When the speed of a truck is increased from 15 miles an hour to 25 miles, the engine cannot be speeded up at anywhere near the same ratio, for if it is, its life will be comparatively short. A short engine life, and a consequent cost of repairs might offset the advantages of greater truck speed enabling more work to be done and less other repair work by reason of the greater cushioning effect of the pneumatic as compared with the solid. In other words, the present fitting of pneumatic tires on trucks seems in many instances to be a blind one, made without full investigation and thus more of a makeshift than a real installation.

Apart from the changes in the chassis itself and in the engine, there are also the problems of proper tire pump mounting and the necessity of carrying a spare tire. A large percentage of the truck models at the show were fitted with tire pumps driven off the gearset.

Public Highways.—It is officially announced that all work hitherto performed by the Joint Roads Committee relating to public highways has been transferred to the Ministry of Transport (Roads Department), 7, Whitehall Gardens, London, S.W.1, except the settlement of claims in respect of third party timber traffic. These claims will continue to be dealt with by the Joint Roads Committee.

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MOTOR TRAFFIC

OMNIBUS SERVICES IN CENTRAL SCOTLAND.

SUCCESSFUL DEPARTURE BY FALKIRK TRAMWAYS COMPANY.

The success which has followed the enterprise of the Falkirk and District Tramways Company in starting a motor service in conjunction with the tramway can be regarded as further proof of the popularity and utility of such facilities when efficiently organised. From the smallest possible beginning, a comprehensive system has been evolved, reflecting great credit upon its organisers and placing transport services at the disposal of a widespread population, which has readily shown its appreciation.

Fig. 1.—Standard Single-Deck Omnibus—Scottish General Omnibus Company.

The purpose of the Scottish General Omnibus Company—which recently acquired the assets of the omnibus department of the Falkirk and District Tramways Company—is to develop motor omnibus services in Central Scotland, linking up a number of industrial and shipping centres. From the appended plan of the routes an idea may be gained of the importance of the districts, which previously were almost entirely dependant upon inadequate railway services.

It was in the year 1913 that the Falkirk and District Tramways Company purchased one W.P. 2, Commer char-a-bancs, and in the summer of that year carried on a successful motor touring business. This result led to the purchase of a second vehicle, and the company continued touring services until the outbreak of the war. One of the chars-a-bancs was then acquired by the War Department, leaving the company with the original vehicle. With the advent of petrol rationing the touring business was restricted, and the company considered the possibility of providing regular passenger services, for which there was great need owing to the development of munition works in the district. The Commer char-a-bancs was immediately put into this service, and as traffic soon showed that further vehicles were required the company made a careful study of the type of machine best suited to their purpose, in order to avoid the expense of carrying the large variety of spare parts inseparable from the running of a mixed fleet. Eventually it was decided to adopt the Tillings-Stevens petrol electric chassis as standard, and additional vehicles of this type were added from time to time, until in August, 1919, the company owned eight single-deck omnibuses and four chars-a-bancs. The standard omnibus is shown in Fig. 1 and the char-a-bancs in Fig. 18.

Fig. 2.—Plan of Routes.

Owing to the rapid growth of the business it was at this time decided to dispose of the omnibus assets to the Omnibus Company in order more fully to develop the motor services. Orders were placed for additional machines, and the company now has a fleet of 26 Tilling-Stevens petrol-electric vehicles. Twenty of these are of the single-deck omnibus type and the remainder are touring coaches seating 27 passengers. Part of the fleet is shown in Fig 3.

The gas bags, however, have now all been removed as the vehicles are being operated solely on motor spirit.

The omnibuses and the chars-a-bancs are all mounted upon the Tilling-Stevens standard petrol electric chassis, which by reason of the electric transmission system has been found particularly suitable for passenger transport. The elimination of the clutch and gears and the consequent smooth steady motion render it a particularly comfortable vehicle. The simplicity of the control is another strong point in its favour, there being only the engine throttle pedal and the electrical field regulation lever on the steering column to handle. As frequent starting is inseparable from a passenger service, the advantages of the petrol electric system are apparent. To stop the vehicle the driver has only to throttle down the engine and apply the brakes when the current generated falls below the minimum required for motion. To restart, the brakes are taken off and the throttle opened, the result being a smooth, jerkless, but rapid acceleration. A point of importance is the ease with which these vehicles can be restarted on an up gradient, frequently a difficult operation with a gear-driven machine. Owing to the action of the motor it is impossible for this type of machine to get out of control and run backwards downhill. It is further claimed that the smooth stopping and starting prolong the life of the vehicle, and minimise the cost of upkeep.

The following is a brief description of the chassis—Maximum length behind the dashboard is 19 ft. 4 in., and the wheel base 14 ft. 6 in. Including the body, as illustrated, the maximum load does not exceed 4 tons, making a gross loaded weight of 7 tons 10 cwts. The frame is of pressed steel throughout, strongly braced by cross members having large gussets formed solid with them. The

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MOTOR TRAFFIC

dynamo and motor are carried on two longitudinal sub-members. The engine is of the four-cylinder enclosed vertical type, with a bore of $4\frac{3}{4}$ in. and a stroke of $5\frac{1}{2}$ in., cylinders cast in pairs with inlet and exhaust valves on the near side. The valves are interchangeable and are operated by a single cam shaft driven by a chain from the crank shaft. Lubrication of the engine is entirely automatic, the oil being circulated by a gear-driven pump. The ignition is effected by a Thomson-Bennet high tension magneto driven from the cam shaft by means of an enclosed skew gear; while a Zenith carburetter fitted to a water-jacketted induction pipe assures an easy start with rapid acceleration.

Fig. 3.—Part of the Fleet of Omnibuses and Chars-a-bancs.

The cooling arrangements comprise a centrifugal pump, driven from the same skew gear as the magneto, with water pipes of large diameter and a radiator of the plain and gilled tubular type. A fan mounted on ball bearings is fitted between the engine and the radiator to assist cooling by induced air draught. Great care is used in the selection of the material for the manufacture of the dynamos and motors of these machines. The highest quality of material in conjunction with first-class workmanship on a well-tried design has produced a reliable electrical driving plant, which experience has shown to be practically fool proof. The insulation resistance of the armature and field coils of both generator and motor is not less than 2 megohms, and, before being sent out, they are tested at a pressure of 2,000 volts A.C. between windings and frames.

Fig. 4.—Falkirk Garage.

The controller and speed regulator are carried in separate aluminium cases. The controller is of the tramway type with screw adjustment to the contact fingers. The speed regulator is of the multiple contact type, and operates by varying the resistance in the shunt field of the generator and by shunting the series field of the motor. Easily renewable resistance units are fixed to the base of the controller. The switches are constructed entirely of metal and micanite.

The drive from the electric motor to the back axle is by means of a propellor shaft fitted with universal joints at each end. The back axle is worm driven, and is placed above the worm wheel. The worm casing carries this wheel and the complete differential with its journal and thrust bearings and can easily be removed for inspection. Into the back axle case are pressed steel tubes and over these are steel castings which form seatings for the springs and anchors for the brakes. The steel tubes project through these castings and form the journals for the rear wheels. There are no torque rods, as the torque is transmitted through the spring bracket castings, which are securely bolted to the back axle case. The oil tempered steel springs are of ample proportions. Cast steel wheels are fitted, the front taking single tires 900 mm. by 120 mm. and the rear wheels twin tires 1010 mm. by 120 mm. Dunlop tires are used. Two powerful and entirely independent brakes are provided. The steering gear is of the well-known Ackerman type, the worm and sector being enclosed in dust-proof casing.

The Scottish General Omnibus Company provides regular services from Falkirk (which is Scotland's principal centre for the light casting industry) to Grangemouth and Bo'ness—both important shipping centres on the River Forth. Passenger services are also in operation in and around Stirling, and other localities are shortly to be opened up. The sketch plan, shown in Fig. 2, is descriptive of the company's present and contemplated passenger routes in the Stirlingshire, Linlithgowshire, and Clackmannanshire areas. In addition to the regular passenger services, the company carries on a very successful pleasure touring business and enjoys a well earned reputation over a wide area for the excellence of its facilities.

Some of the omnibus bodies were built by Messrs. Thomas Tilling, Limited, of Camberwell, and the remainder by Messrs. Christopher Dodson, Limited, of Willesden. The chars-a-bancs bodies were also the work of Messrs. Thomas Tilling.

The company has at present two garages—one in Falkirk, shown in Fig. 4, and a temporary one at Bridge of Allan, a small township about three miles distant from Stirling. An extensive garage, however, is in course of erection in Stirling. A plan of this is shown in Fig. 5.

Meantime the principal repairs are carried out at the Falkirk Garage (Fig. 6) which is part of the tramway depot of the Falkirk and District Tramways Company.

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The general organisation and method of operation of the Scottish General Omnibus Company's business may be roughly divided into three heads, namely, traffic, engineering, and office, and as the company's activities are likely to extend in course of time over a wider area, and district garages established in different parts of Central Scotland, a system had to be evolved which, without being too elaborate, would enable the management at a head office to keep in close touch with the entire organisation even when the contemplated extensions are completed.

Referring first to the Traffic Department, each district has its own traffic superintendent, who is responsible for the whole of the traffic work in his particular area. The traffic superintendent's duties comprise the keeping of all records (on loose leaf forms) appertaining to traffic matters; and these records are returned daily to the head office for examination and filing.

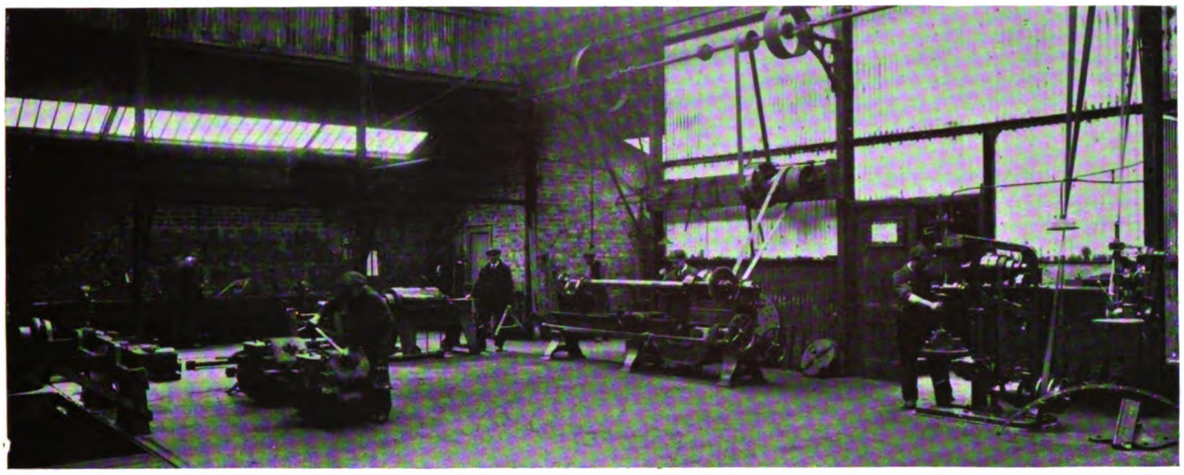

Fig. 6.—Repair Depot at Falkirk Garage.

An important traffic form is the "Daily Service Sheet," (Fig. 7) which is utilised as follows—On the evening of each day the traffic superintendent knows the traffic commitments for the following day, either for regular or touring services, and for each class of service he also knows, from specially prepared mileage sheets, what the mileages will be. He therefore completes a daily service sheet by entering under appropriate heading the service, the route number, and the mileage. The sheet is then passed on to the Engineering Department.

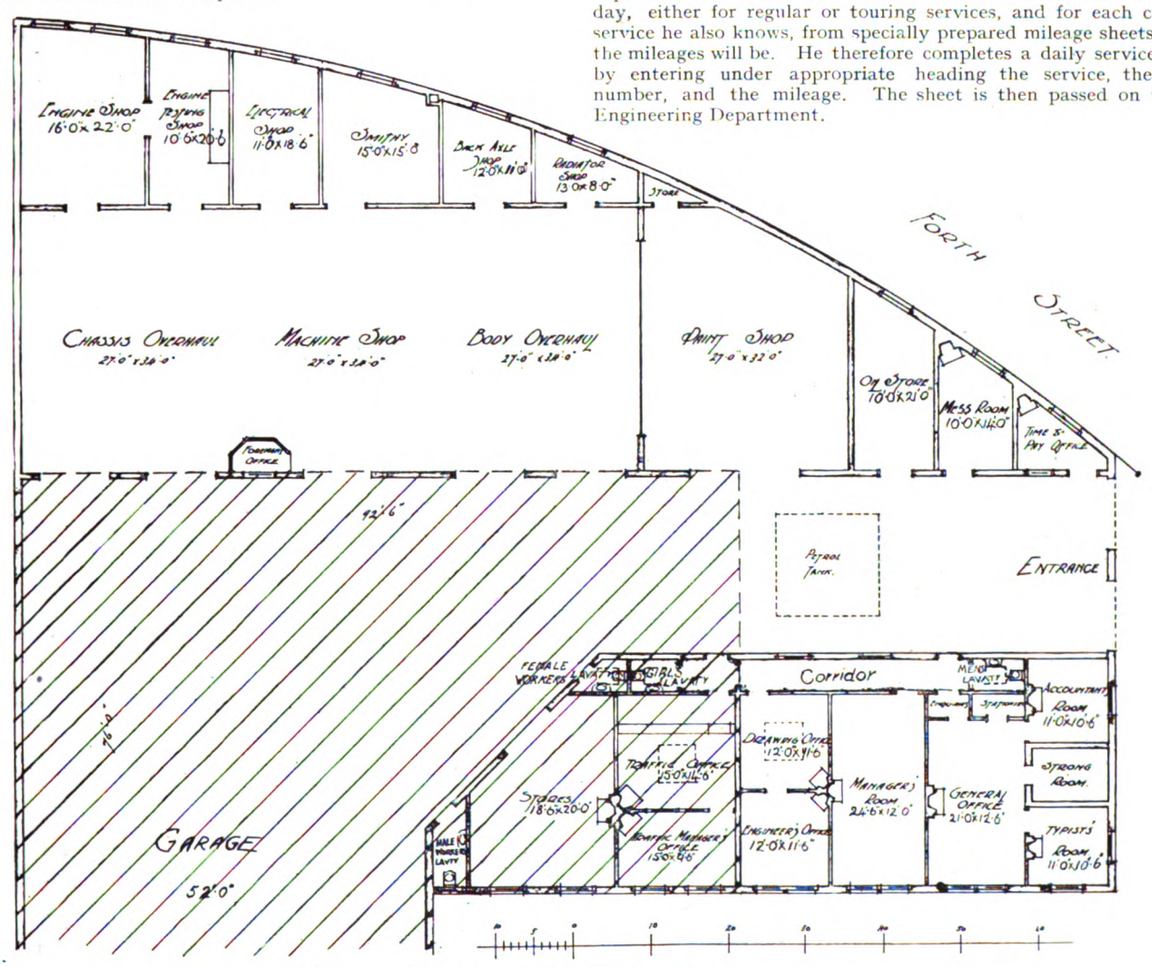

Fig. 5.—Plan of Sterling Garage.

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MOTOR TRAFFIC

The garage superintendent afterwards decides from his knowledge of the condition of the plant the machines to be detailed to the respective services, and completes the sheet by entering the omnibus numbers in the appropriate column. The sheet is then posted on the notice board. Drivers know from the output list (Fig. 8) what duty they are on, and a glance at the daily service sheet also shows them to what vehicle they are detailed. After the day's work is over, the daily service sheet is returned to the head office from each district, and is used for compiling both total and vehicle mileages. Any change over with consequent loss of mileage is recorded on this sheet; the accompanying specimen illustrates such a breakdown, and the change over of a vehicle. It will be noted from this form of return that although omnibus

S. G. O. Co., Ltd. District Sterling

DAILY SERVICE SHEET.

Friday Date 23rd January 1920

Service.	Route No.	Bus No.	Time Out.	Mileage	Mileage Lost.	Total Mileage.	Remarks.
	1	15	9 10 AM	105 48		105 48	
Bridge	2	14	9 40	83 04		83 04	
[illegible]	3	13	10 10	105 48	82 04	23 44	See Drivers Report
Alloa	4	5	1 50 pm	70 33		70 33	
Stirling	5	3	2 0	83 04		83 04	
Bannockburn	6	8	2 20	46 88		46 88	
	7	2	2 30	46 88		46 88	
	8	13	3 10	46 88		46 88	
Fallin	1	12	12 50 pm	64 40		64 40	
Alva	1	3	8 0 AM	18 56		18 56	
	2	7	12 20 pm	81 36		81 36	
			CHANGE OVERS.				
B.J.A.	3	18	1 15 pm	83 04		83 04	

E. Nolan Traffic Superintendent.

L. Richardson Garage Superintendent.

Fig. 7.—Specimen of Daily Sheet.

mileage is lost, the total mileage is complete, another machine having taken up the running.

Breakdowns on service are recorded by means of Breakdown Forms, both traffic and engineering, copies of which are shown in Figs. 9 and 10. From these forms it will be noted that the time of the breakdown has to be given by the driver, and the time at which assistance arrives. The Engineering Department is called upon to give similar information. A complete check is thus maintained, and the management is able to see whether unduly long periods elapse between breakdowns and their rectification.

Another traffic form is the "Inspector's Daily Report" (Fig. 11), on which inspectors give particulars relating to time-keeping. Any

Output List for Week ending ..... *19* .....

Duty.	Route No.	Due Out.	SUNDAY.		Duty.	Route No.	Due Out.	MONDAY.		Route No.	Due Out.
			Driver.	Conductor.				Driver.	Conductor.		

Fig. 8.—Specimen days of "Output List.

late running has to be explained and if the explanation is not satisfactory, the case is dealt with.

On the engineering side, a system of inspection has been adopted which, whilst not so frequent as on some undertakings, has proved to be sufficient to keep the whole fleet in first-class condition. Every machine comes into the repair shop once in 11 weeks for dock overhaul. At this overhaul the engine is attended to; valves ground in: tappets seen to and adjusted; magneto and lighting dynamo thoroughly inspected and cleaned; and the carburetter cleaned and adjusted. The back axle is also gone over, wheels removed, springs greased, brakerigging put into thorough order, new parts, bushes, etc., fitted where necessary. The differential is removed and is examined. Front wheels are also removed, and the front axle

District Falkirk

THE SCOTTISH GENERAL OMNIBUS COMPANY, LIMITED.

No.

BREAKDOWN REPORT.

All defects causing delay or detention must be reported on this Form.

Date 11th February 1920 Time 3 17 p.m.

Service Grangemouth & Boness Place Manor Street

Bus No. 22.

Particulars of Breakdown or Delay.

[illegible]

Sir

I beg to report when about to start from Manor Street on above Journey. I could not get Engine to start up owing to defective ignition. The Conductor phoned from Head Office to Garage at 3.25 p.m., but the phone was engaged & it was some time before she was put through.

Yours Obediently

(Sgd) Owen Lamb

Time lost in consequence of above 1 hour

Number of Single Journeys lost in consequence of above 2 between G'mouth & Boness

Assistance rendered by Mr Scroggie at (state Time) 4 pm

Signature (Sgd) O. Lamb

Reports must be made out and dropped into Report Box immediately work ceases for the day.

Fig. 9.—Traffic Dept. Breakdown Report.

thoroughly inspected, springs greased, etc. The chassis is carefully examined, bolts tightened up, steering gear attended to, while the body is looked over and minor repairs carried out.

A form used in connection with this overhaul that has proved very useful is designated "Defects requiring attention but not seriously affecting running" (Fig. 12). This form can be filled up by driver, conductor, inspector, or any member of the engineering staff who may come in contact with a vehicle while in service. These forms are filed, and are referred to when the machine comes in for its dock overhaul. If the form relates, for instance, to engine trouble, and the chief engineer has satisfied himself that the defect is too bad to be allowed to continue, the entire engine is changed. The same procedure is followed with reference to the back axle or any part of the chassis where a complete change of part can be effected.

Ordinary running repairs are carried on in the usual manner, signing-off sheets being used in each area as per accompanying sample (Fig. 13). The information contained on the signing-off sheets is ultimately transferred to a chart, shown in Fig. 14, and a glance from time to time at this chart enables the responsible official

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MOTOR TRAFFIC

to see whether the same defects are being repeated on the same vehicle, and to deal with the case accordingly.

Another form used by the company which has proved very useful is a weekly summary sheet, shown in Fig. 15. On this sheet the number of breakdowns in each district is noted, the number of accidents, the number of offence reports, of bad time-keeping reports, lost mileage, dead mileage, number of machines overhauled, and number of machines on the last day of the week in each garage. These forms are intended for circulation around the different garages so that superintendents, either traffic or engineering, can see at a glance how their records compare with other districts.

Petrol consumption is, of course, also carefully watched, and the quantity used recorded on daily petrol records. These come in to the head office from the Engineering Department and the mileage column is completed from the daily service sheet. A record is kept of the financial side of the undertaking through weekly cost sheets (Fig. 16) and traffic return form (Fig. 17).

From the above it will be seen that every day the company's chief official has before him the following records—

(1) "Traffic Returns Form" from which can be seen the revenue derived from each route, the mileage on each route and the receipts per vehicle mile on each route. Over a period, therefore, an opinion can be formed as to whether a service requires increasing or reducing.

(2) "Daily Service Sheet," from which can be seen the number of vehicles running in each area with mileage, and whether there has been any disturbance to service owing to breakdowns. If any disturbance is recorded details are forthcoming from the drivers' breakdown report form, which is supplemented by the engineering report form.

(3) "Inspectors' Daily Report," showing how the various services have been running in respect of time-keeping.

(4) "Petrol Records Form," from which can be seen the amount of petrol used, and the petrol per vehicle mile.

(5) "Signing-off Sheet," which shows from day to day the general condition of the vehicles in service.

District Falkirk

THE SCOTTISH GENERAL OMNIBUS COMPANY LIMITED.

BREAKDOWN REPORT.

ENGINEERING SECTION

Date 11th February/20 Service Grangemouth & Bonnybridge Bus No. 22

Time on Scene of Breakdown 4 p.m.

Particulars of Breakdown and how dealt with —

Received telephone message at 3.45 p.m.
Proceeded to Manor Street on Bus No 4
Located fault in contact breaker Broken Arm & Dust Cover
Renewed fault in contact Breaker by obtaining Pivot Pin

Vehicle took up running again at (state time) 4.15 p.m.

* Vehicle ~~run or towed into Garage at~~ (state time)
* Delete words which do not apply

Signature of Mechanic or Engineer attending on Breakdown A. E. Scroggie

Note—Reports must be made out and dropped into Report Box first thing every morning

Fig. 10.—Engineers' Breakdown Report.

District Falkirk

THE SCOTTISH GENERAL OMNIBUS COMPANY, LIMITED.

Inspector's Daily Traffic Report for Saturday day 6th March 1920

Service	Time-Bonus-No. on Working Rules & H.O.	Time Checked.	Terminus or Place.	How Running. (If late, Explain.)
Grangemouth	Route No 3	2.55 p.m.	Manor Street	On Time
Grangemouth	Route No 1	4.5 p.m.	Manor Street	10 Minutes late
Bonnies	Route No 4	4.10 p.m.	Manor Street	On Time
Grangemouth	Route No 6.	11.10 p.m.	Manor Street	On Time

EXPLANATIONS *RE* LATE RUNNING.

Quote Entry No., and give full particulars and how dealt with. If insufficient space, use overleaf.

Sir. Entry No 2.

Re above entry. Driver Bain reported that his engine had stopped on Grangemouth Station Bridge owing to there being water in the carburetter (Bus No 4). He cleaned carburetter & proceeded to Manor Street, leaving there at 4.3 p.m. instead of 3.55 p.m. - 10 minutes late.

A. Cameron. Inspector. (Sgd.) W. Ronaldson Traffic Superintendent.

Reports must be in Office by not later than 10 a.m. the following day.

Fig. 11.—Specimen Inspectors' Report.

District

THE SCOTTISH GENERAL OMNIBUS CO. LTD.

DEFECTS REQUIRING ATTENTION

But Not Seriously Affecting Running

Bus No......

The undernoted Defect Requires Attention (state clearly and briefly) —

Reported by..... **Remedied by**.....

Date..... **Date**.....

Fig. 12.—Form for Reporting Defects.

THE SCOTTISH GENERAL OMNIBUS CO. LTD.

DISTRICT

SIGNING-OFF SHEET *Day* *Date*

VEHICLE No.	CONDITION OF VEHICLE	HOW REPAIRED OR DEALT WITH
7 (31)	Engine lost very warm, water pump leaking, Wipers malfunctioning & petrol leaking badly	Examined & found Magneto defective to limit. Water pump pressure filled
4 (31)	Water Connection at pump leaking	Water Connection at pump tightened up.
15 (31)	O.K	
5 (31)	Grease cup on pump broken	New grease cup fitted
3. (31)	Rear end joint blowing	New rear end joint fitted
13. (31)	O.K	

Fig. 13.—Specimen Signing-off Sheet.

The Scottish General Omnibus Company, Limited

Summary of Daily Records for Week ending 3rd March, 1920

	Falkirk.	Stirling.	
No. of Breakdowns affecting Passenger Service	1	1	
No. of Breakdowns not affecting Passenger Service	None	None	
No. of Bad Time-keeping Reports	None	None	
No. of Offence Reports	None	None	
No. of Accident Reports	1	1	
Total Mileage for week	2621·44	5499·15	
Mileage Lost owing to Breakdowns	10	6	
Dead Mileage	4	31	
No. of Vehicles Dock-Overhauled	2		Nos. 9 & 10
No. of Vehicles in Garage (last day of week)	10	12	

Fig. 15.—Summary of Records for Comparison.

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MOTOR TRAFFIC

District.....

THE SCOTTISH GENERAL OMNIBUS COMPANY LTD.

SUMMARY OF SIGNING-OFF BOOK
for month of ..... 19 ..

D—Driver. C—Condition.

Abbreviations.	Bus Nos.	1		2		3		4		TOTAL.	
		D.	C.	D.	C.	D.	C.	D.	C.	O.K.	Defects.
	1										
Engine - - E	2										
Back Axle - BA	3										
Front Axle - FA	4										
Steering - - S	5										
Chassis - - CS	6										
Springs - - SP	7										
Brakes - - B	8										
Petrol Tank - P	9										
Radiator - - R	10										
Carburetter - C	11										
Magneto - - M	12										
Generator - G	13										
Motor - MR	14										
Dynamo - - D	15										
Wheels - - W	16										
Tires - - T	17										
Valves - - V	18										
Misfiring - MF	19										
Controller - CR	20										
Resistance - RS	21										
Lighting - - BL	22										
Body - - BY	23										
Not Run Slow-WS	24										
Dock - - X	25										
Painting - - O	26										
Total O.K. per Day -											
,, Defects ,, -											

Fig. 14.—Daily Report of Condition of Vehicles.

Expenditure and Revenue Statement

For Week ending.....

EXPENDITURE	Current Week: Cost per Mile	Details £	s.	d.	Cost per Mile	Total £	s.	d.
TRAFFIC EXPENSES								
Superintendence								
Wages of Drivers								
,, Conductors								
Cleaning Cars								
Oiling and Greasing								
Ticket Check								
GENERAL EXPENSES								
Management								
Income Tax								
Insurance and Licenses...								
Advertising								
Printing and Stationery &c.								
Re-hires								
Stores								
GENERAL REPAIRS AND MAINTENANCE								
Repairs—Buses								
Tires								
Buildings								
Tools								
Depreciation								
POWER								
Petrol								
Gas...								
Total Costs								
Total Nett Receipts ...								
Nett Revenue								
Total for Weeks to Date — Costs ...								
Total for Weeks to Date — Receipts ...								
Total for Weeks to Date — Nett Revenue								

	Mileage	Passengers
Miles per Gall. of Petrol.....		
Mileage to date		

Fig. 16.—Detail Cost Sheet.

The Scottish General Omnibus Company.

Traffic Returns for Week ending.....

Routes.	Receipts. Thursday. Receipts.	Thursday. Mileage.	Thursday. Receipts per Mile.	Total for Week. Receipts.	Total for Week. Mileage.	Total for Week. Receipts per Mile.	Corresponding Week Last Year. Receipts.	Corresponding Week Last Year. Mileage.	Corresponding Week Last Year. Receipts per Mile.	Increase. For Week.	Decrease. For Week.	Passengers Carried. Current Year.	Last Year.	Increase.	Decrease.
Grangemouth and Bo'ness...															
Stirling and Bridge of Allan															
Fallin															
Hillfoots															
Private Hires (Falkirk) ...															
Private Hires (Stirling) ...															
Contracts (Falkirk)															
Contracts (Stirling)															
Total															
Last Year ...															
Increase ...															
Decrease ...															

Fig. 17.—Specimen Day together with Weekly Records of Receipts.

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MOTOR TRAFFIC

Turning to weekly records there are—

(1) "Detailed Cost Sheets" and (2) "Summary of Daily Records."

In actual operation the above system has been found to be simple and at the same time to provide a very close record of everything that takes place from day to day.

Our thanks are due to Mr. D. Hays, director and general manager of the Scottish General Omnibus Company, for his courtesy in enabling us to publish this account of an undertaking that promises to become one of the most important transport services in Scotland.

RAILLESS ACCUMULATOR CARS PROPOSED FOR ILFORD.

Ilford Council is considering a proposal to obtain additional transport facilities by running railless cars to the site on which one thousand new houses are to be erected by the City of London Corporation and the London County Council. The Ilford Tramways Committee have asked the tramways manager, Mr. L. E. Harvey, to prepare a detailed comparative report with reference to railless traction and motor vehicles so far as affects the proposed additional transport facilities.

In a preliminary statement, which led the Council to ask for a fuller report, Mr. Harvey said that he had on several occasions reported upon suitable routes for omnibus services, but the Council had decided that the time was not ripe to apply for powers to run omnibuses. Having regard to the fact that a large number of houses are about to be erected, it was clear that the present service of omnibuses run by the London General Omnibus Company would not be sufficient for the needs of the district, particularly at certain hours. In view of these conditions Mr. Harvey thought the Council ought to provide, as soon as possible, some means of transport from Ilford station to Barkingside and possibly further. Having in mind the high cost of electric vehicles at the present time, and also that to operate petrol omnibuses would mean a complete innovation for the tramways department and necessitate a special staff, he suggested that railless omnibuses should be adopted. Mr, Harvey added that in the course of a conversation with the general manager of the Bradford Corporation Tramways, it was ascertained that the cost of working railless cars taking current from the trolley wires when running on tramway routes and from accumulators when running on roads where there were no overhead wires was approximately 6d. per omnibus mile less than for petrol vehicles. He proposes to visit Bradford shortly to investigate further the operation of the railless system there.

A description and illustration with details of working costs of the Bradford railless accumulator vehicle was given in our issue of March 18.

ROAD CHARGES ON OMNIBUSES.

DECISION OF THE MINISTRY OF TRANSPORT.

Sir Henry Maybury, of the Ministry of Transport, made an important statement on March 18 on the subject of motor omnibuses and road maintenance before the Select Committee of the House of Commons, which was considering the Leigh Corporation Bill. The Corporation sought powers to run omnibuses in their own and outside districts, and were opposed by the Lancashire County Council on the cost of reconstruction and maintenance of roads.

After consideration, the Minister of Transport, said Sir Henry Maybury, was of the opinion that a maximum of, say, 1½d. per omnibus mile should be paid in all such cases for maintenance charges. With regard to adaptation charges for making the roads suitable to bear this particular kind of traffic, the Minister considered that a clause should be inserted in such Bills providing for the payment of a maximum sum of £700 per road-mile. In the event of any difficulty arising, the matter should be settled by an arbitrator appointed by the Ministry of Transport. The maintenance contribution hitherto has been generally fixed at ¾d. or 1d. per car-mile.

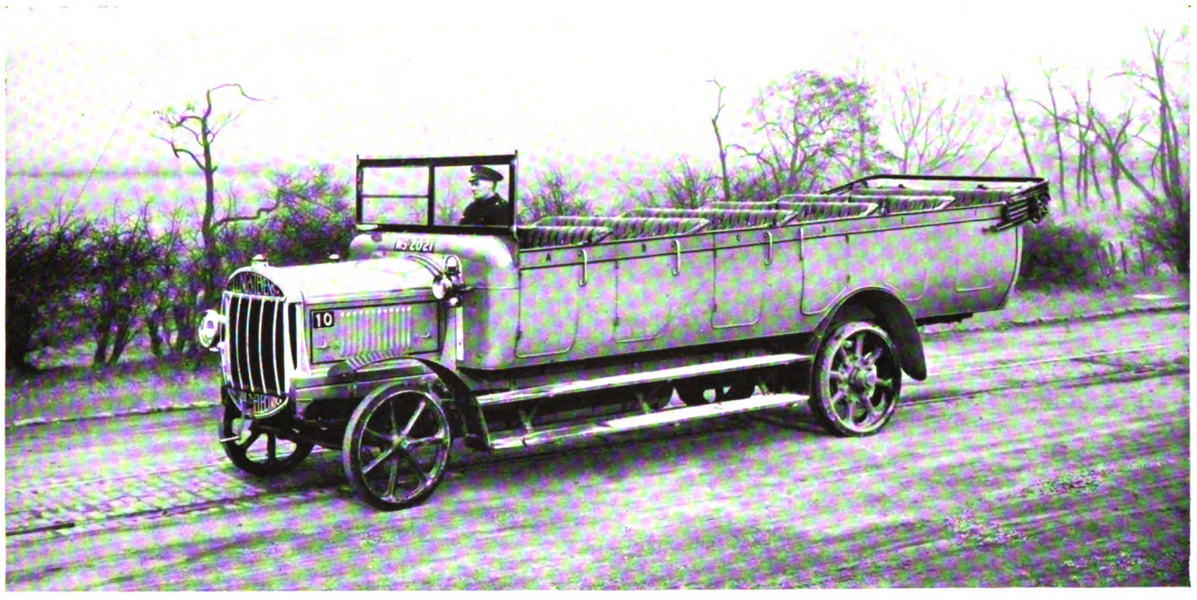

Fig. 18.—One of the Scottish General Omnibus Company's Fleet of Chars-a-bancs.

On March 23, a Private Bill Committee of the House of Commons passed the preamble of the Bill, permitting the Corporation to run omnibuses within their boundaries. The Committee, in consequence of the opposition of Leigh Rural Council, which preferred proposals made by the South Lancashire Tramways Company to establish omnibus services, did not grant the Corporation's request for power to run in the rural area, except to Hindley. In giving evidence against the Bill, Mr. E. H. Edwardes, general manager of the South Lancashire Tramways Company, said they had ordered ten omnibuses and had mapped out a service over 32 miles within and outside the borough of Leigh. Lancashire County Council asked for an adequate contribution towards adaptation and maintenance of the roads.

The Committee deferred coming to a decision upon the proposals of the Transport Ministry until they had heard the Huddersfield Corporation Bill in which the same question is raised. The Chairman intimated that the decision in favour of Leigh was subject to the insertion of a clause to prevent the Corporation competing with the South Lancashire Tramways Company along their existing lines, with the exception of 173 yards between Twist Lane and Bradshawgate, over which the proposed omnibus service will pass from one route to any other.

CARS AND OMNIBUSES FOR PLYMOUTH.—Plymouth Corporation are seeking sanction to borrow the sum of £63,000 for the following purposes—Fourteen new tramcars, £28,000; twenty omnibuses, £30,000; machinery and plant, £5,000.

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MOTOR TRAFFIC

THE MOTOR CAR INDUSTRY.

Prices and Delay

At a luncheon at the Savoy Hotel, London, on April 8, by the Society of Motor Manufacturers and Traders, an interesting account was given by Mr. F. Lanchester as to cost of cars and delay in delivery. His statement was mainly connected with the production of pleasure cars, but at the same time it has a more general bearing and is also of interest to the users of commercial vehicles. At the close Sir Julian Orde, of the Royal Automobile Club, and Mr. Jarrott, of the Automobile Union, voiced the grievances of those who experienced great delay in delivery.

Mr. Lanchester, in the course of his statement, said: "Early in 1919 when manufacturers were called upon to decide and publish their business programme and sales policy they were confronted with a new outlook. The old method of producing car models and ascertaining the cost of them was impracticable. Manufacturers were faced with the problem of six months' work in re-organising their works after the change over from war work, before the early stages of car manufacture could be considered. The autumn of 1919 found the manufacturers with car prices fixed provisionally upon estimates of what raw materials were costing, or likely to cost, and on wages that were then current, which appeared high enough to warrant a fall rather than a rise. Unfortunately, the anticipations of any fall in the costs of either materials or wages, when peace conditions were reached, have been disappointed.

Cost of Wages and Materials.

These costs have gone up steadily as will be seen from the following tables—

Wages.

1914.	1919.	1920.
Represented by 100	200 to 225	250

Raw Materials.

Materials	1914	1919	1920
Steel (all types average) ...	100	200	250
Castings, C.I. etc.	100	200	250
Aluminium	100	200	220
Timber	100	300	350

[Note.—The figures for 1920 do not include the percentage increase that will be caused by the award agreed to be given to the engineers on June 1.]

It will be seen from the foregoing figures that motor manufacturers are quite justified on costs in increasing the price of cars to 2½ times that obtained before the war. Yet in fact towards the end of 1919 when costs were double, the prices fixed by the car makers were only approximately 65 per cent. more than in 1914, and to-day when costs are 2½ times those of 1914 manufacturers' prices average less than double pre-war figures. (The latest list prices of 30 representative British cars show a 95 per cent. increase over those of 1914.)

That prices have not gone higher is due to the improved machines and plant now in wide use, and also to the increased output consequent thereon. To the credit also of all manufacturers must be placed the fact that on present costs and money values, more than double the capital has to be locked up on plant, stock and business working expenses, on which a return is required.

Reduction in Cost—Delayed Deliveries.

Every effort must be made to increase economic production. An additional output of work, per man, per day is essential, and in this it is encouraging to note that labour is beginning to settle down with a better spirit. The recent recognition of piece work and the bonus system by trade unions has also improved the situation. A further endeavour in the reduction of costs is of course the system of quantity or "mass" production. The unification of types, reduction in the cost of car parts and the lightening of the load of "dead expenses" are factors that will reduce price and benefit the buyer.

The "moulders' strike" although most disastrous in holding up manufacture and output was only one cause of the delay in delivery. The vital fact was that at the conclusion of the war, entirely unknown conditions had to be faced and a period gone through in which there were difficulties that the most experienced business brains could not anticipate or appreciate. The war ended, the entire atmosphere of the workshops changed. Hours were reduced; overtime was prohibited by the trade unions. Strikes in important industries began, and all the forecasts as to output and progress were disappointed. The above reasons may be taken to have adversely affected the output during the past winter.

The Position To-day.

Labour conditions are now improving and new workers are being drafted into the industry, of whom works managers report excellent results, but the "all clear" cannot yet be sounded. Other traders had, and are still having their difficulties, and that reflects upon the raw material supply. The steel manufacturers are unable to cope with the demand, owing to the shortage of coal. In many cases furnaces, installed during the war, cannot be worked on account of lack of fuel. This is lamentable when the world demand for steel is enormous, and the effect on our trade is and will be most seriously felt. The production of steel in this country at the moment is more than in 1914, but it is some 20 per cent. less than in 1918, and this shortage is going to be most seriously felt.

The motor owner can find consolation, and feel well protected in the future for the following reasons—(1). On the question of price. The motor trade has always been a highly competitive industry, in the hands of many firms, and directly the present artificial conditions cease to exist and deliveries catch up with the orders, it will simply be a question of supply and demand. (2). With regard to the disappointing delays in delivery, there is not a manufacturer who is not just as concerned as the buyer in good output and prompt deliveries. Many companies have had to go through a period of twelve months with practically no revenue. These facts will show that the car prices of to-day are fair and just, and that the delay in delivery was inevitable.

SALE OF SLOUGH DEPOT.

Great Works Acquired by British Purchasers.

The Ministry of Munitions announced on April 9 that the motor transport repair depot at Cippenham, Slough, had been sold for £3,350,000. The depot cost the Government £2,500,000, so that the nation realises (the Ministry stated) a profit of £850,000 on the transaction. The purchasers also acquire the whole of the motor transport and spare parts remaining unsold in this country and abroad belonging to the Disposal Board, for a minimum sum of £3,650,000, this amount to be increased proportionately according to the sale price realised by the buyers on the re-sale of the vehicles. The total amount so far realised including the above sum of £3,650,000, for the sale of motor transport is £17,350,000, of which £4,500,000 is in respect of vehicles which have been repaired and conditioned at Slough since the work commenced nine months ago.

It is understood that any sum above the published minimum of £3,650,000 realised on the sale of transport repaired at Slough is to be shared equally by the Government and the syndicate. Mr. S. A. Wallace has stated that in the negotiations he acted as intermediary, and all the capital behind the scheme is British. The purchasers intended to organise the depot on national lines as a transport undertaking, besides manufacturing cars.

W. & G. COMMERCIAL VEHICLES.

A new illustrated and finely produced 60-page list of commercial vehicles produced in the works of Messrs. W. and G. du Cros, Limited, has been issued. It also deals with the complete facilities afforded in their modern factory at Acton, W.3, covering more than seven acres. The following extract is worthy of attention—"From the earliest days of motoring W. and G. du Cros, Limited, have specialised in motor transport service of every description, and the efficiency of the W. and G. service has earned for them an unequalled reputation in the transport world. The experience gained throughout those years is incorporated in the W. and G. commercial vehicles." Specialities of the firm are 2-ton and 30-cwt. chassis for commercial vehicles, designed as the outcome of their experience in running commercial services for numerous owners, relieving them of the work of maintaining the fleets. The completeness of the service is shown by the provision of bodies for any class of work, and by the execution of repairs to every make of private car and commercial vehicle. The facilities for body building result in distinctive designs, which are a valuable advertisement to the owners of W. and G. vehicles. Specifications are given of the 2-ton and 30-cwt. machines, and there are seventeen pages of illustrations of complete W. and G. commercial vehicles, every part of which is standardised and numbered, thus ensuring prompt delivery of spares. Demonstration runs are given to prospective purchasers.

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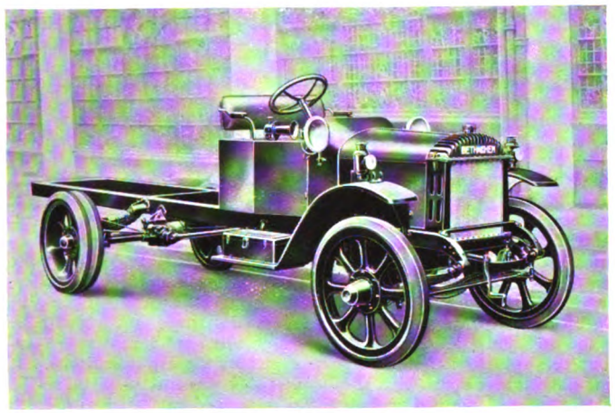
MOTOR TRAFFIC

BETHLEHEM MOTOR VEHICLES.

The appointment of sole concessionnaires for Great Britain and Ireland, France and Belgium, for the famous Bethlehem motor trucks has been secured by the London and Midland Motors, Limited, 445, Oxford Street, W.1. An idea of the attractive appearance of this well-tested machine will be gained from the photograph of the 1½-ton chassis which is given on this page. The Bethlehem truck is also obtainable in 2½ and 3½-ton models; full details concerning them may be obtained on application to the London representatives. Each description of chassis is standardised throughout its class, with the result that the highest workmanship is put into the manufacture. The appended specification of the 3½-ton chassis will be of interest :—

Capacity.—3½ tons nett load. Designed to stand excess strain.
Engine.—Bethlehem. Four cylinders especially designed to meet the requirements of truck service. Cylinders L head cast in pairs. Crankshaft exceptionally large with three main bearings. Constant level oiling system. Pump forced circulation cooling system. Bore and stroke, 4⅜ × 6 inches.
Ignition.—American Bosch Magneto.
Starting and Lighting.—Gray and Davis.
Radiator.—Armoured cast tank with fins to catch the cool air. Mounted on cushion with floating spring suspension. Exceptionally large cooling surface.
Clutch.—Single plate, dry disc, easily adjustable.



Bethlehem Chassis.

Transmission.—Selective sliding gear, three speeds forward and one reverse. Gears heat treated, nickel steel, case hardened. Central control.
Governor.—Monarch maximum speed on road 12 miles per hour. Also governs possibility of racing or racking engine at low speeds.
Drive.—Through two universal joints and tubular shaft.
Drive Shaft Steady Bearing.—Prevents any possibility of drive shaft whipping and eliminates wear on universals.
Front Axle.—I-Beam drop forged nickel steel, heat treated spindles. Roller bearings throughout.
Rear Axle.—Internal gear type, nickel steel gears throughout. Entire load carried on 3⅛ inch solid nickel steel dead axle. Double heat treated, spindles exceptionally large.
Service Brakes.—Double-acting external contracting on rear wheels.
Emergency Brakes.—Double-acting internal expanding on rear wheels.
Front Springs.—27½ inches long, 2¼ inches wide, single shackled in rear.
Rear Springs.—51¾ inches long, 3 inches wide, semi-elliptic.
Wheels.—Steel.
Tires.—Solid, dual on rear.
Steering Gear.—Worm and nut, located on right side. 18-inch wheel.
Frame.—34 inches wide, rear, with insweep to 31 inches front, 20 feet 8 inches long, 7 inches deep, with top and bottom flanges 4 inches wide. ¼ pressed steel channel section. Four cross members in rear of driver's seat. Distance from back of driver's seat to end of chassis, 13 feet.
Wheel Base.—13 feet 6 inches. Track on front wheels, 56 inches. Track on rear wheels, 65¼ inches.
Petrol Tank Capacity.—13⅜ gallons—gravity feed.
Chassis Equipment.—Electric head, tail and side lights, indicator, mechanical horn, complete tool kit, tool box and jack.

NEWCASTLE AND OMNIBUS POWERS.

Opposition from Outside Companies.

Presenting to the Local Legislation Committee of the House of Commons on March 23 the case for the general powers Bill promoted by Newcastle-on-Tyne Corporation, Mr. Lloyd, K.C., stated that they desired to operate motor omnibuses on ten routes, and also for a general power to run such vehicles in Northumberland, and in the two urban districts of Ryton and Blaydon, in Durham.

The reason of the opposition of the North Eastern Railway Company, said counsel, was the fear of competition with the railway and because the vehicles would be run by a local authority with the rates behind them. Four other petitioners would urge that they could provide the required services, but counsel contended that they were not able to give a through route. Other petitioners raised the question of contribution to the roads. This matter was being taken up by Government departments, with a view to securing uniformity, and he was willing to put into the Bill whatever the Minister of Transport decided upon. The Corporation proposed to pay a penny per car per mile, which was a considerable advance upon what used to be paid. Regarding the Tyneside Tramways Company, who also opposed, counsel said that they also proposed to run omnibuses, but the Corporation were seeking to buy the company's undertaking by agreement.

Mr. E. Hatton, the tramways engineer and manager, giving evidence as to the proposed tramway routes, said that it was astonishing how the two great communities of Newcastle and Gateshead had been content to remain without means of communication across the High Level Bridge. The omnibus routes were adapted for coupling up outlying villages with the city mainways. He believed in omnibus services to such seaside places as Whitley Bay and Seaton Sluice. The extension to Heddon would afford practically the only means at the disposal of residents for making use of the Corporation tramways. The mining villages in the Newcastle district were continually developing, and applications were received to run a omnibus here and an omnibus there. The Corporation, instead of having to come to Parliament every time a village wanted an omnibus service, desired the general powers proposed in the Bill.

Several members of neighbouring local authorities gave evidence, and one stated that he preferred the service to be provided by the Corporation rather than by the Northern Transport Company. The latter would not contribute anything towards the cost of the roads, but the Corporation would.

On March 25 Mr. R. J. Howley gave evidence against the Bill on behalf of the Tynemouth and District Traction Company. The proposed omnibus service to Whitley would compete with the company's tramways.

The Chairman (Col. W. Guinness) remarked that the committee were not concerned with competition if there was an opening for new transport facilities, but they did not want to see the ratepayers involved in a dangerous speculation.

Mr. Howley said there was no reason why anyone should want to go from Newcastle to Whitley by omnibus, as the railway service was very good. An omnibus would take at least 100 minutes for the 12-mile journey.

In cross-examination, witness said he did not think the days of tramways were over, but the omnibus would be the means of transport in sparsely populated districts. His point was that competition would diminish the profits and the purchase price of the tramways to be paid in 1922 by the local authorities.

Mr. H. England, general manager, Yorkshire (West Riding) Electric Tramways Company, dissented from the Corporation's estimate of 5½d. per omnibus mile operating cost, and said there had been big increases since Walsall last year estimated the operating cost as 7½d.

The committee decided not to allow an omnibus service along the tramways route, but they had no wish to prevent the omnibus going into the borough.

Mr. Hilton, chairman of the Northern Transport Company, said the company could run from Scotswood Bridge to Ryton directly the Minister of Transport had settled their dispute with the County Council; but the Committee decided to give the Corporation power to run over this route.

Gosforth Urban Council opposed the Gosforth routes on the ground that the Corporation desired to strengthen their case for taking Gosforth into the city. However, the committee granted routes Nos. 4 and 5, and adjourned till April 14.

New Belgian Petrol Company.—A new company has been started at Antwerp, called "La Societe Financiere des Petroles." It is hoped that the undertaking will eventually make Belgium's supply of liquid fuel independent of foreign countries.

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MOTOR TRAFFIC

MOTOR VEHICLES FOR MUNICIPALITIES.

Wood Green Urban Council are purchasing vehicles for the collection of house refuse.

Ilford Council have purchased a chassis for £400, for use in connection with the isolation hospital.

Lewisham Council have appointed a sub-committee to consider the provision of motor disinfecting vans.

Rotherham Corporation have asked the borough engineer to obtain further tenders for the supply of two electric covered vehicles for the highways department.

Stretford Urban Council have purchased a 2-ton Commer motor, with body and automatic tipping apparatus complete, for £1,105, and a car for the electricity department.

Swansea Corporation, to avoid the cost of establishing a number of permanent weighbridges, have decided to purchase a motor van at a cost of £300 to carry a portable weighing machine.

The Central (Unemployed) Body for London have secured a 3-ton Dennis lorry, in excellent condition, through the Disposal Board, for £650. It is required for Hallesey Bay farm colony.

Wolverhampton Corporation have given permission to Birmingham and Midland Omnibus Company to run a motor omnibus service between Ettingshall Road and a central point in Wolverhampton.

Glasgow Health Committee have accepted the offer of the South Western Coach Works to supply two new chassis at £725 each, and the Cleansing Committee are purchasing a car for the farms manager.

Birmingham Corporation have purchased from the Daimler Company two (nearly new) 30-h.p. four-cylinder ambulances for £750 each. Now the Corporation have six motor ambulances to deal with accidents.

The Metropolitan Asylums Board are spending £450 on additional temporary garage accommodation at Queen Mary's Hospital. There are four electric vehicles and a petrol omnibus at the hospital, but now two electrics are more or less unsheltered.

Worthing Corporation have insured the motor fire engine with the Municipal Mutual Insurance, Limited, against (1) public liability in the sum of £1,000; (2) accidental damage; and (3) fire risk in the sum of £1,500, at an annual premium of £20 12s. 6d., less 15 per cent. commission.

East Ham Corporation are considering the purchase of vehicles for general cartage. A special committee, reporting on the tenders received, have come to the conclusion that a lighter type of vehicle would be more efficient and economical. It has therefore been arranged to get tenders for the supply of two 1-ton or 1½-ton wagons from firms of repute.

The Health Ministry have sanctioned the purchase by the Metropolitan Asylums Board from Messrs. R. Garrett and Sons, Limited, of a steam tractor and four trailers for cartage work at a cost of £1,865. The vehicles are required for the Darenth Training Colony. A 30 cwt. motor lorry for use at the Dartford institution is to be purchased by the Board.

PETROL PRICES.

Suggested International Inquiry.

The Commercial Motor Users' Association, which is represented on the Board of Trade Committee, appointed to investigate the prices of motor fuels, has had under consideration the report of that Committee and has forwarded a resolution to the League of Nations expressing opinion that a further and immediate inquiry should be made through the instrumentality of the League of Nations to ascertain the true facts concerning the allegations of profiteering in petroleum products and freights thereon, with a view to international action in the direction of control of prices, should the allegations be sustained.

The Profiteering Committee's Report.

In the House of Commons on March 22, Captain Tudor Rees asked the Prime Minister what steps he proposed to take to give effect to the report of the Profiteering Committee that the present price of petrol is excessive and without justification.

Mr. Bridgeman (Parliamentary Secretary to the Board of Trade), replied that the Board of Trade propose to discuss further with the companies the various items of cost to which the sub-committee called attention. Even if it were found possible to effect a temporary reduction he thought we must face the fact that the demand for motor spirit is growing more rapidly than the supply, and that, short of a complete international control, which was hardly a practical proposal, the most effective method of preventing an increase of price was the use of other forms of liquid or gaseous fuel. The Board of Trade were examining the various possibilities with the assistance of the Fuel Research Board. There were difficulties in the way of an extended use of gas, particularly the fact that supplies of town gas were not too plentiful. He hoped that it would be possible in due course to increase the production of benzol, but this again would be a limited quantity. The greater use of alcohol was no doubt one remedy, but a good deal of research, both as to possible sources of supply and the provision of a cheap and efficient denaturant, would be needed, and it would, he feared, in any case be a long time before large quantities could be expected to be available

ROAD TRANSPORT IN THE RAILWAY STRIKE.

In the House of Commons on March 17, Commander Kenworthy, on the vote of £470,000 to defray the expenses of the emergency transport which was put into service during the railway strike, complained of the extravagant salaries and wages paid to the motor drivers and others.

Sir J. Rees said to object to expenditure which saved the country from unparalleled difficulties when disaster was impending seemed to him perfectly astounding.

The Home Secretary said that where any payment of wages was made, it was on the Trade Union rate. These people came to the rescue, and they deserved the pay they got. It had been estimated that directly and indirectly the strike cost the country something like £10,000,000, but how much was lost to the railways and the country by delay and disorganisation it would be very difficult to say. Having regard to the gigantic task which was before them, he thought they had obtained the services they did as cheaply as could possibly be expected—(cheers).

The vote was agreed to.

PUBLICATIONS RECEIVED.

Tilling-Stevens Publicity.—Several excellently designed booklets and folders have been issued by Tilling-Stevens, Limited, of Maidstone. The publications describe and illustrate the petrol-electric vehicle in use as lorries, fire extinguishing appliances, omnibuses, chars-a-bancs, arc welding outfits (mobile and fixed), portable and fixed generating plant, motor generator sets, workshop lorries, and mobile kinema outfits. All of those machines are in extensive use by municipalities, companies or private firms, and it will be to the advantage of undertakings which are contemplating extensions to apply to the company for copies of these publications. A four-page folder deals with the busy scenes presented by the works at Maidstone, where day and night shifts are worked in order to meet the demand for their products, which during the war were in great request by the Army and Navy.

Henley Tires.—From the Henley Tyre and Rubber Company, Limited, 18, New Union Street, E.C.2, we have received a copy of their current list of solid rubber band tires, which are obtainable at their ten branches throughout the country. These tires have proved their worth on all descriptions of commercial and industrial vehicles, and the testimonials comprise a number of references to tires which have far exceeded the guaranteed mileage. The hundreds of users include the tramway departments of the London County Council, and Liverpool Corporation; also the London General Omnibus Company. The hints given for the care of tires should be in the hands of every driver and garage worker. One recommendation is for jacks for lifting the lorry when out of use and for keeping the tires off an oily floor.

Empire Roller Bearings.—Mr. T. W. How, managing director of the Empire Roller Bearings Company, Limited, 13, Victoria Street, S.W.1, has issued a preliminary catalogue of the company's products. Owing to the war, manufacture was suspended in 1916, but was resumed in 1919, and the company is now associated with Messrs. Ransomes and Rapier, Limited, of London and Ipswich. The catalogue describes and illustrates the functions of roller bearings for line shafting (with their saving in power, lubrication, belting, and motors); for trucks, wagons and trollies; for cages and rollers; and for railway and tramway rolling stock. Over 3,500 of the latter type have been supplied to one railway.

Omnibus Scheme for Four Counties.—Hertfordshire County Council are promoting a Bill for powers to run omnibuses in Hertfordshire, Essex, and London. The preamble declares that it is expedient that the omnibus undertakings of the County Councils of Middlesex, Hertford, Essex, and London north of the Thames should be under joint control, and worked by a joint committee under working agreements.

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MOTOR TRAFFIC

COMMERCIAL MOTOR USERS.

THE ASSOCIATION'S BUSY YEAR'S WORK.

In their sixteenth annual report the Commercial Motor Users' Association state that the Council have given special attention during the past year to the question of the development of home produced fuels. The funds for a scheme of research into alcohol mixtures at Manchester University were provided by the Royal Automobile Club and the Association jointly. The Association had continued to provide the funds for carrying to the House of Lords the test action for alleged extraordinary traffic damage to roads at Weston-super-Mare on the part of two steam wagons and trailers used for hauling stone from quarries.

MINISTRY OF TRANSPORT AND ROAD BRIDGES.

Active work was conducted to secure fair treatment for road traffic interests when the Ministry of Transport was formed. The Association secured the insertion of the following clause in the Act, the words in parentheses being added as a railway amendment in the House of Lords despite opposition on behalf of the Association—

"An appeal shall lie to the Minister in respect of any restriction upon any traffic passing over or seeking to cross any bridge or culvert, and the Minister shall have power, notwithstanding any provision in any other statute, to make such order as he may think fit concerning the strengthening, standard of maintenance, and maintenance of any bridge or culvert, the traffic using it or seeking to use it, and apportionment of any expenditure involved (but no order made by the Minister under this section shall enlarge the pecuniary liability of any railway or canal company, or impose any new liability upon any such company)."

The Association was invited by the Ministry to nominate, under Section 23 of the Act, four representatives to serve on the panel of experts, and the names of Mr. E. S. Shrapnell-Smith (chairman), Major-General S. S. Long (vice-president), Mr. Walter Wolsey, jun. (vice-chairman), and Mr. W. G. Verdon Smith (member of Council) were submitted.

On the Ministry of Transport Committees which are dealing with the question of the taxation of and regulations affecting road vehicles and lights on vehicles, the Association is represented by their chairman, Mr. Shrapnell-Smith.

CLOSING OF ROADS TO HEAVY MOTORS.

The Association had opposed the application made by Cornwall County Council for a regulation prohibiting the driving of heavy motors on Coombe Road, and it is anticipated that the application will be withdrawn. An amicable settlement had been reached with the Lancashire County Council in the matter of closing certain roads to motor coaches. The Association had preserved means of access to Coniston village from the north, whilst in the case of the local roads in the Fylde area an alternative route for return traffic was agreed.

FREIGHT EXCHANGES AND VEHICLE CLEARING HOUSES.

Considerable attention had been given to proposals for co-ordination of freight exchanges and vehicle clearing houses. It is felt by the National Council that bad results—alike for owners of vehicles and consignors and consignees—will inevitably supervene unless steps are taken to ensure that this class of organisation is properly conducted, and that overlapping effort is eliminated. The following interim conclusions have been reached, after investigation by the Traffic Committee—

In favour in principle of the establishment of traffic exchanges as being conducive to a higher efficiency of road transport.

Strongly recommending the National Council not to give approval to any company-promoting proposals.

Recommending the National Council to encourage the development of traffic exchanges, but before taking steps to this end to ascertain through its Divisional and Area Organisation the lines on which such action should proceed.

Labour Exchanges of the Ministry of Labour should not be utilised for the purpose of traffic exchanges.

The National Council, after receiving the views of Divisional and Area Committees, and after further consideration of the position at a joint meeting of the Traffic Committee and Finance and General Purposes Committee, is considering an investment, in co-operation with its Liverpool Area Committee, in the shares of the established clearing house at Liverpool.

MOTOR OMNIBUS SERVICE AT NOTTINGHAM.—Nottingham Corporation tramways will shortly provide a service of motor omnibuses running from Bentinck Road Junction to Bagthorpe. Three vehicles of the single-deck type have been delivered and others will probably be purchased. Application has been made to the Ministry of Transport for sanction to a list of fares, and when this has been received the service will be commenced.

STREET ACCIDENTS IN 1919.

2,628 FATALITIES AND 48,698 ACCIDENTS.

A Home Office return issued on March 22 shows a heavy increase in the number of fatalities and accidents caused by vehicles in the streets of the United Kingdom. The details are as follow—

	1919.		1918.	
	Fatal.	Non-fatal.	Fatal.	Non-fatal.
Horse-drawn vehicles ...	440	7,708	476	7,188
Motor omnibuses ...	211	2,451	182	1,988
Electric tramcars ...	187	6,679	262	7,294
Motor cars, motor vans, etc.	1,612	23,868	1,147	12,520
Pedal cycles	178	7,992	126	6,742
Totals	2,628	48,698	2,193	35,732

In the Metropolitan Police district last year there were 687 fatal and 18,998 non-fatal accidents, and in the City 13 persons were killed and 714 injured. Of the deaths in the whole of the London area, including the city, 140 were caused by motor omnibuses, 403 by other motor vehicles, 41 by tramcars, 102 by horse-drawn vehicles, and 14 by pedal cycles. The 18,998 cases of injury were thus divided—Horse-drawn vehicles, 3,135; motor omnibuses, 2,085; tramcars, 2,919; other motor vehicles, 8,612; pedal cycles, 2,961.

MOTOR TRAFFIC NOTES.

BIRMINGHAM-HEREFORD OMNIBUS SERVICE.—The Birmingham and Midland Omnibus Company have recently inaugurated a service of single-deck omnibuses in Hereford.

LEYLAND COMPANY DEPOT IN CANADA.—Leyland Motors, Limited, have sent Mr. W. E. Humphreys to Toronto to establish a depot for their vehicles. During the war Mr. Humphreys served as an officer in the navy, and was in command of a submarine.

OMNIBUS PROPOSALS FOR WALTHAMSTOW.—Having considered a report on motor omnibuses prepared by the tramways manager, the Walthamstow Tramways Committee have recommended the promotion of a Bill to enable the Council to run omnibuses.

EXPERTS' EVIDENCE FOR OMNIBUS POWERS.—Swansea Corporation have retained Mr. A. R. Fearnley, of Sheffield, in addition to Mr. J. B. Hamilton, of Leeds (already retained) as expert witnesses in connection with the motor omnibus clauses of the Corporation Bill.

BIRKENHEAD AND WALLASEY OMNIBUSES.—A temporary agreement has been arrived at for the running of the motor omnibuses of Birkenhead Corporation to Wallasey. When the Wallasey Corporation have obtained delivery of their vehicles now on order, the agreement will be revised.

ORDER FOR EIGHTY-ONE TILLING-STEVENS OMNIBUSES.—The operation of 150 Tilling-Stevens petrol-electric omnibuses by the Birmingham and Midland Omnibus Company has proved so satisfactory that an order has been given for an additional 81 single-deck onnibuses of the same type.

LANCASHIRE OMNIBUS LEVY.—Lancashire County Council propose to consent to the running of a regular omnibus service by Messrs. A. Foley and Company between Preston and Garstang for a period of five years, on payment of 3d. per car-mile, with an initial fee of £110 per omnibus per annum.

LONDON OMNIBUSES AND HOUSING.—The London General Omnibus Company have asked East Ham Corporation for information as to the number of houses to be erected and the estimated accommodation, in order that they may consider the requisite transport facilities in connection therewith.

STRETFORD'S URGENT NEED.—The Urban Council have had an interview with the Mid-Cheshire Omnibus Company, and understand that they are prepared to consider the provision of a temporary omnibus service between Stretford and Urmston, and that the company are pressing forward delivery of omnibuses which are on order.

GOODS HAULAGE IN LANCASHIRE.—A Liverpool scheme for a fixed rate of charges for road motor haulage of goods from the city to outlying districts, including all the important towns within a radius of 50 miles, came into operation on March 29. It is stated that the charges compare favourably with the railway rates to the same districts.

RATES FOR ROAD HAULAGE.—A scheme has come into operation in Liverpool for a fixed rate of charges for the haulage of goods by motor lorries from the city to outlying districts. It is stated that the charges compare favourably with the railway rates. The scheme includes all the important towns within a radius of about thirty miles.

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MOTOR TRAFFIC

TRAMWAYS COMPANY'S ENTERPRISE.—At Swansea Corporation a letter was read calling attention to the fact that there are no transport facilities between Cwm and Swansea, and mentioning that the tramway company were prepared to run a motor omnibus service if the Corporation would consent. The matter was referred to a committee for consideration.

HOLIDAY OMNIBUS SERVICES.—The London General Omnibus Company resumed at Easter practically its full Sunday and bank holiday services into the country. In addition to the routes reinstated, services were run to Leatherhead from Putney Bridge Station, to Caterham from Muswell Hill, to Taggs Island from Charing Cross, and to Boxmoor from Golders Green.

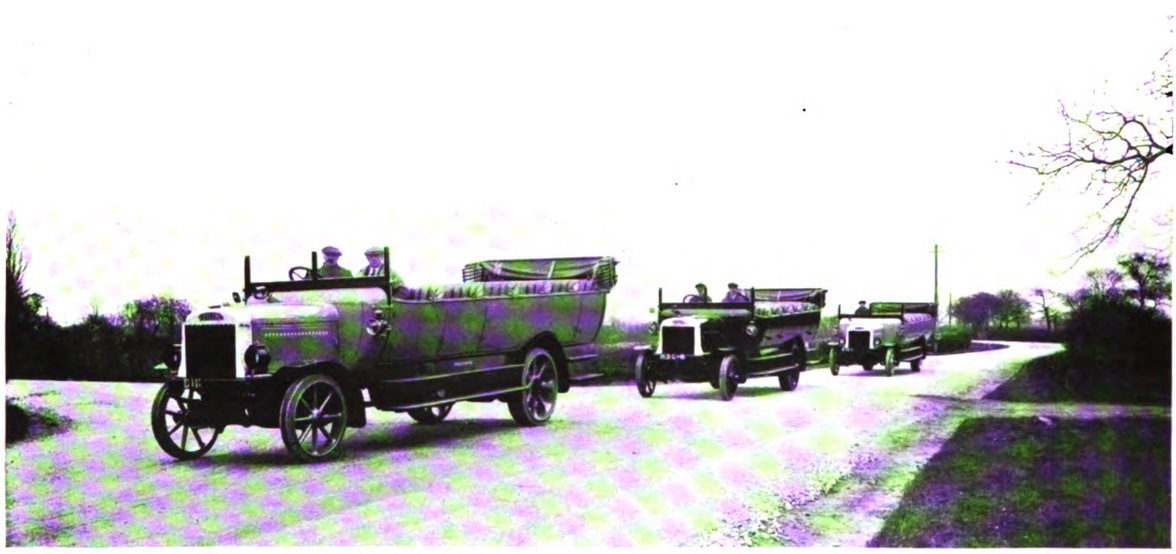
TROLLEY V. PETROL OMNIBUS COSTS.—Rotherham Corporation give the following details regarding the running of a trolley omnibus and a petrol omnibus for the month of January—*Trolley omnibus*—Cost per mile, 16·391d.; revenue per passenger, 3·29d.; working cost per passenger, 3·35d. *Petrol omnibus*—Cost per mile, 24·132d.; revenue per passenger, 3·34d.; working cost per passenger, 3·90d.

TAX ON COMMERCIAL VEHICLES.—Plymouth Corporation have considered the use of roads by commercial vehicles, and report that the Minister of Transport should be informed that it is desirable a charge should be leviable in respect of heavy commercial vehicles using the public roads, or that the vehicles should be taxed in proportion to the damage which they cause to the public roads.

CHARS-A-BANCS SERVICE AT MANCHESTER.—The Manchester Watch Committee have granted a licence to a firm of motor chars-a-bancs owners to ply for hire between Nicholas Croft, Manchester, and Harpurhey, and to another firm to ply for hire between St. Peter's Square or Stevenson Square and Blackpool. Councillor Johnson explained that the first application was granted with the object of relieving the tramway congestion. Other similar applications would each be dealt with on their merits. The Watch Committee were only concerned with the question whether the vehicles to be employed answered the purpose.

WHEEL GUARDS FOR LORRIES.—Dr. Waldo, coroner for Southwark, at an inquiry into the death of a woman who was knocked down by a motor oil tank, stated that in 1919 he held inquests in 44 traffic fatalities, in 1918, sixty-three, and in 1917, sixty-eight. In his report for 1919 he again advocated that all heavy motors should be compelled to use life-guards similar to those on the rear wheels of omnibuses. It was not generally known that the London County Council had power to make a by-law to that effect, and he hoped that the Commissioner of Police would insist on this urgent reform. The rear wheels of heavy motors without side-guards killed 60 per cent., as compared with 40 per cent. by the front wheels.

TRAFFIC IN RESIDENTIAL STREETS.—Marylebone Borough Council have received several complaints with regard to the vibration and serious inconvenience caused by the increasing number of lorries and traction engines of the largest size—the latter drawing heavily loaded trucks—which travel through residential streets, including those which contain many nursing homes. It is urged that the vibration from this heavy traffic is not only detrimental to the property, but that the noise and smoke from the engines constitutes a grave public nuisance. The Borough Council have drawn the attention of the Ministry of Transport to the complaints, and suggested that residential streets, especially those in which there are nursing homes, should not bear too large a proportion of the heavy traffic.



Leyland "De Luxe" Motor Coaches Undergoing Final Road Tests Before Delivery.
[These machines are of the 4-ton type with 36-40 H.P. engines. They have seats for 28 passengers.]

A NORTHUMBERLAND TRANSPORT SCHEME.—In connection with the Agricultural Co-operative Society formed for Northumberland, a scheme has been started for conveying goods to farmers from the railway stations and taking produce from the farms on the return journey. A steam lorry is busily employed in the Whittingham district, the rates being 1s. 6d. per ton per mile (5-ton loads) to and from the station; other loads in proportion.

SPEED RESTRICTIONS OF MOTOR VEHICLES.—Sir Eric Geddes, asked whether the time had now arrived when the necessity for the special speed restrictions of ten miles an hour upon motor vehicles should be inquired into in the light of experience gained since their imposition, said that the question of restrictions on the speed of motor vehicles was one of the matters still to be considered by the Committee on the Taxation and Regulation of Road Vehicles. The need for the removal of existing restrictions which might not now be necessary would be considered by the committee.

LIGHTS ON ROAD VEHICLES.—Sir Eric Geddes recently stated in the House of Commons that the departmental committee appointed to consider and report on lights on road venicles has now presented a further interim report, and the desirability of the publication of both reports is receiving consideration. He anticipated that the committee dealing with the taxation and regulation of road vehicles would present its interim report within a fortnight. If any legislation was required the House would be given an opportunity to discuss the recommendations before any action was taken.

MOTOR OMNIBUSES IN EDINBURGH.—Mr. R. Stuart Pilcher, manager of Edinburgh Corporation Tramways, in a recent address, said that the city's transit problem had now entered upon an entirely new phase. Extensions into the suburbs and beyond the city boundaries had become practicable and these facilities could be given by means of motor omnibuses before electrification of the tramways was carried out. Although the omnibus had advantages in certain ways, it must advance much further in the way of enlarged seating capacity and freedom from vibration before it could displace the electric car. There was, however, scope for both forms of traction. There was no doubt that the dense population of the city would quickly avail itself of the new facilities by moving out into the area of Midlothian, which it was proposed to bring within the city boundaries.

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THE Tramway & Railway World
WITH MOTOR TRAFFIC SECTION

Founded 1892. LONDON, MAY 13, 1920. VOL. XLVII.

USE OF LIGHT TRAMWAY CARS IN FRANCE.

SINGLE-TRUCK ONE-DECK TYPE—AN APPROXIMATION TO RECENT AMERICAN PRACTICE.

In view of the growing popularity of the small "safety" car in the United States, and the probable introduction of similar cars on some of the less travelled lines in this country, it may be useful to recall the way in which the problem has been dealt with in France. It may be said at the outset that what applies to one part of that country will be true, with very slight modifications, of all other parts, for the industry is in the hands of a comparatively small number of companies controlling systems all over the country and even in Algeria.

The most noticeable feature, as is known to every one who has crossed the channel, is that France is whole-heartedly in favour of the single-decker. The only important trial ever given to the heavy vehicle was the introduction of the double-deck cars on some routes in Paris. Even for omnibuses the "imperiale" was unpopular; the passengers did not like the exposure to the weather that this entailed, and in many cases would not be bothered to climb the stairs. So great was the dissatisfaction that the vehicles were superseded and the experiment has nowhere been repeated.

Of the single-deck cars in general use, there are representatives of both the fixed axle and the bogie types. The former are normally employed in neighbourhoods where steep gradients are encountered in order to take full advantage of weight for tractive purposes, while the bogie is preferred for its easier running and the longer car it permits on level routes and where heavy traffic is to be expected. In some towns where the lines run through narrow or tortuous streets on which there is much vehicular traffic, a further argument is found in favour of the short two-axle car. A typical example of the type of car generally in use is that adopted by the Caen Tramways, one of whose latest cars is shown in the accompanying illustration. Here it will be seen that the customary single body panel beneath the windows has been replaced by several panels. This is to allow of easy replacement of any portion that may be damaged in the frequent grazes received in awkward thoroughfares. The wheel base is 9 ft. 3 in., an increase of 2 ft. upon the older type; the wheels have a diameter of 2 ft. 6 in. The car contains 24 seats as well as standing room for another 20 passengers on the platforms. On the same system bogie cars are also in service on a route constructed during the war for the benefit of the industrial region growing up along the sea canal and the mouth of the Orne.

Caen Tramway Car Seating 24 Passengers.

Small Car Used at Havre—Passengers' Shelter on Right.

The second illustration shows a similar car in use at Le Havre, on one of the oldest systems in France. Up to the present, the unusual width of 7 ft. 3 in. has been retained, but is not altogether an advantage, and it is proposed that all new cars shall be of the width of 6 ft. 6 in. Here single trucks are used for all cars, as they have been found more economical in upkeep besides working more satisfactorily on the steep gradients that are a feature in Havre. A further example of the small car in use on the lines of the Compagnie Générale de Tramways is shown in the illustration from Rouen.

In most French towns the two-class system still obtains and is justified by public opinion, although it cannot be said to lead to a simplification of the transport problem. With this is coupled the provision of platform standing room, the front often being reserved for first-class passengers and the rear platform for the

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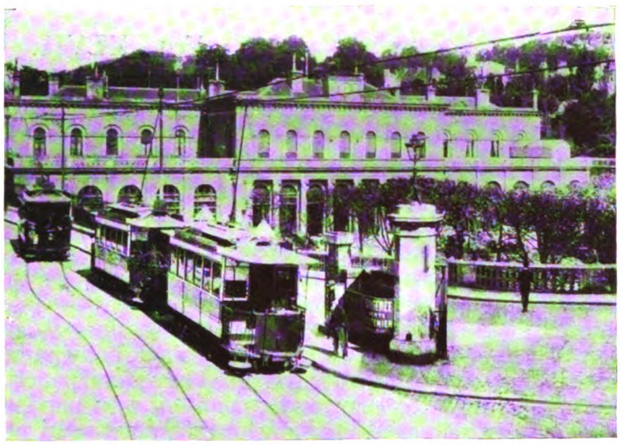
second class. Such an arrangement, of course, entails entrances at both ends, and this is undoubtedly an advantage in picking up and setting down passengers at important points. At rush hours trailer cars are in general use, and then the rapidity with which loading can be effected at the many doors approaches the ideal. The trailers are similar in general design to the motor cars, but they are, of course, of lighter build.

A new departure in Continental practice is to be seen



Small Cars at Rouen.

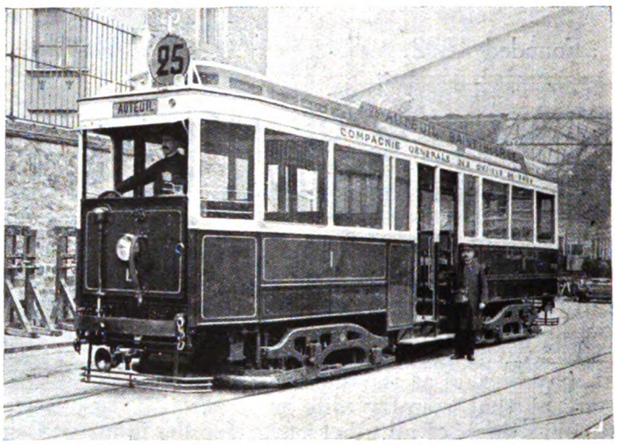
in the enclosed type of car now being designed for localities exposed to particularly inclement weather. In these the existing entryways and platforms are abolished and replaced by central doors. The motorman thus obtains a separate compartment, and at the same time is freed from the distraction of surrounding passengers and protected from the weather. The change will be greatly appreciated in seaboard towns, such as Le Havre, where it is sometimes necessary to face the full strength of the Atlantic gale.

No attempt has so far been made to introduce the American one-man car, and this can hardly be ex-

A Group of Single-Deck Cars at Paris.

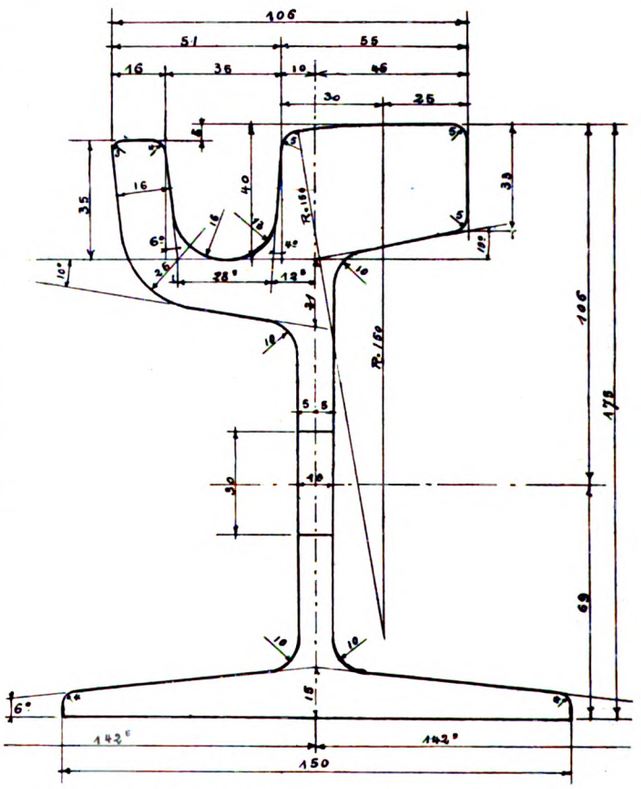
pected while different classes are retained. Where there is only one class, as is the case throughout the United Kingdom, the one-man car presents many advantages, and it would undoubtedly secure greater economy in working costs, a matter of supreme importance in these days of greatly increased wages. With the small car, so severe a strain is not thrown on the permanent way, the rails sustain less wear, and less difficulty is found in maintenance. On the Continent, as in this country, every motor car carries driver and conductor, and there is an additional conductor wherever a trailer is employed. When the Frenchmen were called up for war service there was little hesitation in employing women to fill the vacancies; this was partly due to the greater shortage of labour in France at the outset of the war, and partly to the ease with which the lighter cars may be handled. Women were taken on from the beginning on the same terms as men, performing the same duties for the same pay, and no difficulty was experienced from their working together in any capacity.

A certain amount of replacement was possible during the war, but it was necessary to take what offered at



Paris Car with Centre Entrances and Enclosed Ends.

the moment, with the result that many systems now show a surprising variety of permanent way. As an example, the Caen tramways may be cited, with a total length of about 12 miles and 18 different types of rail put in since the war. In view of such anomalies,



Section of Proposed French Standard Tramway Rail.

a movement for standardisation has been set on foot, and a cross section of one of the suggested standard types is here shown. It will have a weight of 110 to 112 lbs.

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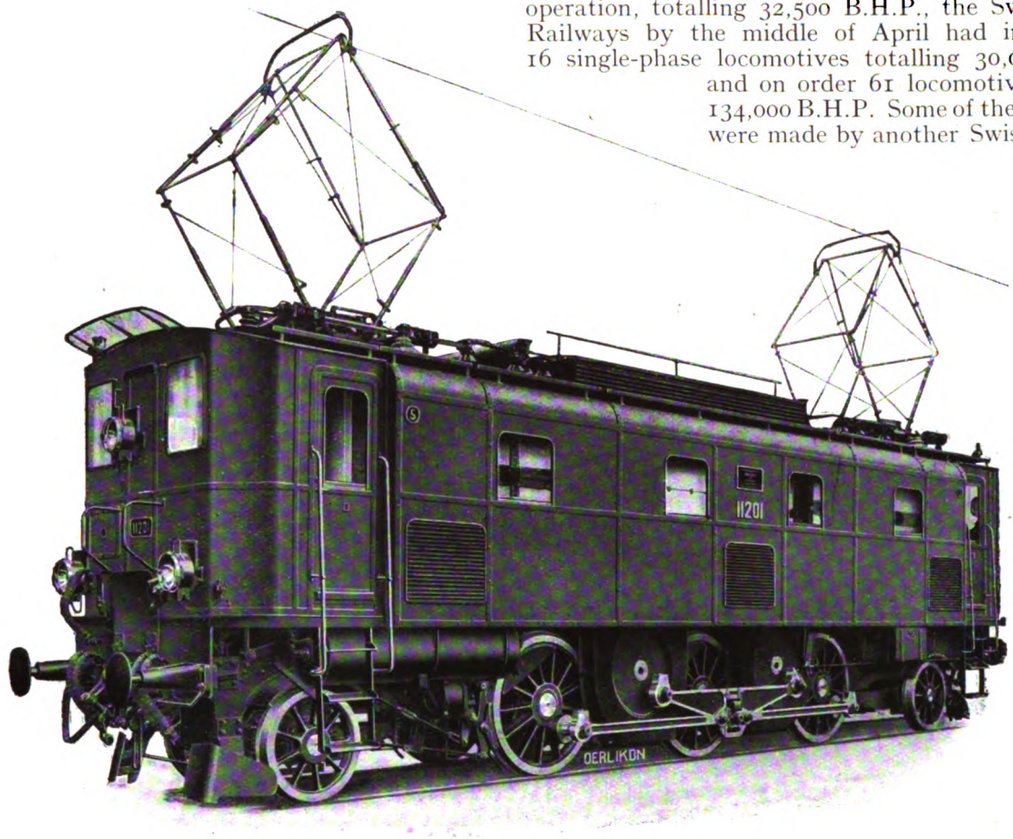
EXPRESS ELECTRIC LOCOMOTIVES FOR THE GOTHARD LINE OF THE SWISS FEDERAL RAILWAYS.

For service on the Lucerne-Chiasso line (formerly Gothard Railway), approximately 140 miles long, the Ateliers de Construction Oerlikon have built for the Swiss Federal Railways two types of electric locomotives for express train services, viz., a small type 2—6—2, and a larger type, 2—4—4—2. The body and mechanical part of these locomotives were supplied by the Swiss Locomotive Works, of Winterthur.

Inclusive of 15 minutes' stand at each terminus, these locomotives are capable of making three return journeys in 24 hours, hauling a weight of 425 metric tons and being assisted by the smaller type, 2—6—2 locomotive, on inclines above 1 in 47. On inclines of 1 in 38 the haulage capacity of the smaller locomotive at a speed of 31 miles per hour is 215 tons, and 300 tons by the large 2—4—4—2 type. When starting on an incline of 1 in 38, a speed of 31 miles per hour is attained in about four minutes.

The principal details of the two types of Oerlikon locomotives are given below.

In addition to the 14 locomotives previously in operation, totalling 32,500 B.H.P., the Swiss Federal Railways by the middle of April had in operation 16 single-phase locomotives totalling 30,000 B.H.P., and on order 61 locomotives totalling 134,000 B.H.P. Some of these machines were made by another Swiss company.



Electric Locomotive (2-6-2 Type) of Gothard Line—Swiss Federal Railways.

Details of Elfctric Locomotives.	2—6—2	2—4—4—2
Current supply	Single phase A.C.	Single phase A.C.
Pressure	15,000/7,500 volts	15,000/7,500 volts.
Periodicity per second	16⅔	16⅔
Horse-power at wheel rims (1½ hr. rating)	1,650 H.P.	2,250 H.P.
Draw-bar pull	19,500 lbs.	26,400 lbs.
Maximum draw-bar pull	30,000 lbs.	40,000 lb.
Normal speed, miles per hour... ...	31	31
Maximum speed, miles per hour ...	47	47
Gauge	4 ft. 8½ in.	4 ft. 8½ in.
Diameter of driving wheels	4 ft. 3 in.	4 ft. 3 in.
Diameter of smaller wheels	3 ft. 0 in.	3 ft. 0 in.
Length over buffers	44 ft. 4 in.	53 ft. 0 in.
Minimum radius curve	55 ft.	55 ft.
Minimum radius curve of points ...	35 ft.	35 ft.
Weight of mechanical parts	46·5 tons	58·5 tons
Weight of electrical parts	44·5 tons	54·5 tons
Total weight	91 tons	113 tons
Adhesive weight	58·5 tons	80 tons
Coefficient of adhesion (1½ hr. rating)	1 : 6·6	1 : 6·7
Coefficient of adhesion starting ...	1 : 4·3	1 : 4·4
Weight per meter of length ... t/m	6·75	7

Express Locomotive 2—6—2.

The body of the locomotive is carried on three coupled axles and a trailer axle at each end. The trailer axles are connected with the body by a Bissel fork, and possess lateral play of 2 × 80 m/m. These axles are forced into their central position by two leaf springs, immediately above the axles and acting upon a pivot. To allow for easy running round curves the middle axle has 2 in. × 1 in. lateral play. This locomotive is driven as those of the Lötschberg Railway, by two high-speed motors mounted in the centre of the frame and mechanically coupled together. The shaft of each motor carries a pinion at each end, i.e., four pinions all meshing on gear wheels mounted on blind shafts, which on their part transmit the power by means of driving triangles connected with two straight coupling rods to the driving wheels, through a sliding movement which is for the purpose of compensating the play of the separately sprung middle axle. To neutralise the shocks, etc., when starting and running the pinions are spring mounted on the motor shafts.

The frame of the locomotive is made of two longitudinal members 1 in. thick, and is so suspended that

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each axle is tied to the adjacent motor axle transversely and longitudinally by compensating bars. The frame is reinforced where cut out, and the construction permits the removal of the blind shafts and gear wheels without interfering with the main springing.

The body has two drivers' cabs separate from each other, two transformers and oil switch chambers, and a centre space for the motors. The roof and panels can be taken off to allow of easy access and removal of all the electrical apparatus and motors. Easy access to the roof is arranged for by means of a ladder, which, if raised with the current on, causes an alarm whistle to blow, and automatically lowers the pantograph collectors by allowing the air pressure to escape. Brake blocks are fitted to the coupled wheels, giving a braking effort of 80 per cent. of the total adhesive weight, each axle being fitted with a brake cylinder.

The two motors exert a tractive effort at the wheels at 31 miles per hour of 825 H.P. for 1½ hours and 675 H.P. continuously. Each has 12 poles, and is of the compensated series type, with phase displacing auxiliary fields. An electro-pneumatically operated reverser changes the direction of the excitation current for reversing.

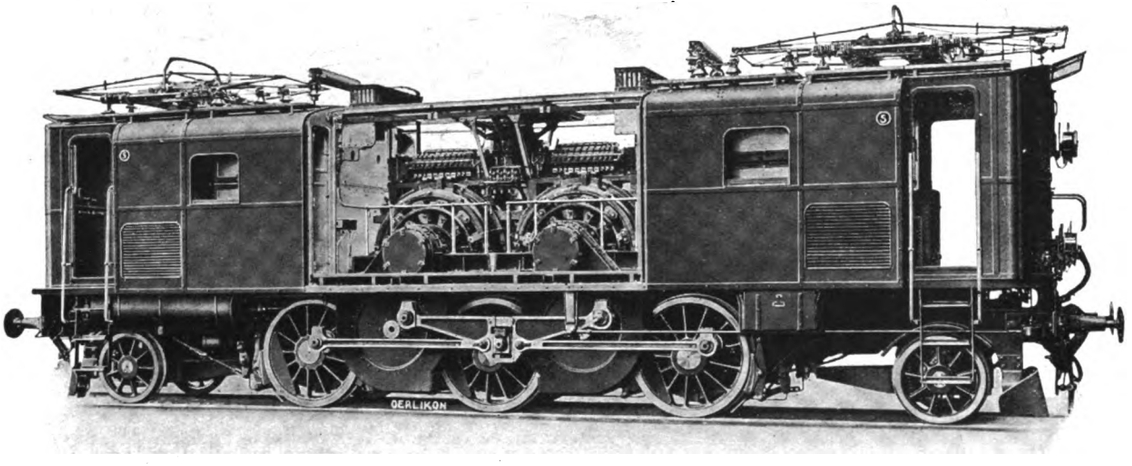
For mechanical reasons principally the double motor arrangement was adopted. This necessitated

(2) Either transformer to supply both motors; in this case normal tractive effort is developed at half speed.

The high tension circuit includes the two pantograph collectors with their disconnecting switches, two lightning arrester choking coils, two switches for the high tension supply, two oil switches, the primary of the transformers, two current transformers for control, one current transformer for instruments, and two earthing connections.

The Oerlikon system of pantographs have a range of working height of about 7 ft. 3 in., and the pressure on the contact wire is approximately constant over the whole range. They are operated pneumatically, and a hand pump is provided for starting purposes. The disconnecting switches on the roof can also be operated from inside the locomotive by means of a key, but only when the pantographs are lowered. The same key serves to open the high tension chambers, which are so arranged that if they are unlocked the high tension apparatus is earthed.

The high tension oil switches can be operated electro-pneumatically from either cab, and are also fitted with hand operating gear for emergency; overload and no-volt release trips are provided. The oil tanks can be easily lowered for inspection of the contacts.



Electric Locomotive (2-6-2 Type) of Gothard Line, with Three Side Panels Removed.

a double equipment to ensure the proper distribution of weight over the axles. This arrangement results in a reduction in the number of spares necessary to approximately one half, and permits the use of contactor control for speed regulation. The 12 contactors per motor give the high range of 23 speeds. These contactors have proved successful and reliable for a number of years on the Lötschberg and other locomotives built by the Ateliers de Construction Oerlikon. They are normally operated by electro-pneumatic control, and can be hand-operated in case of emergency.

The two main transformers are air cooled by means of a fan, and each is connected to its corresponding motor through a contactor in series with a self inductance and current transformer; the latter supplies an automatic cut-out. Normally the two motors and transformers are connected in series, but by means of a group switch mounted over the motors the following disposition can be made—

(1) Each circuit completely isolated from the other in the event of one becoming defective, thus allowing the locomotive to develop half the normal tractive effort at full speed.

The various auxiliary equipment consists of two air compressors, three ventilating fans, one converter set for charging the battery of accumulators which supplies all auxiliary apparatus at 100 volts. The air compressors supply air at from 70 to 100 lb. per sq. in. for the operation of the brake, auxiliary apparatus, etc., and they are controlled by automatic governors. A ceiling fan exhausting from the motor chamber is provided for cooling purposes, and the transformers are cooled by means of fan blowers. The lighting and control circuits are fed from the small converting set in parallel with the two train lighting batteries in series. The heating is provided for by means of tappings on the two main transformers, giving 400 amperes at 500 volts. The locomotive is arranged for multiple unit control, so that two locomotives can be operated from one control position.

Express Locomotive 2—4—4—2.

This type of locomotive consists of two short 1-B bogies, coupled together by a tender, and the frame which carries the body completely envelopes the bogies. The weight of the body is taken on two centre bearings. These are placed rather far apart for constructional purposes, and part of the weight is carried by roller

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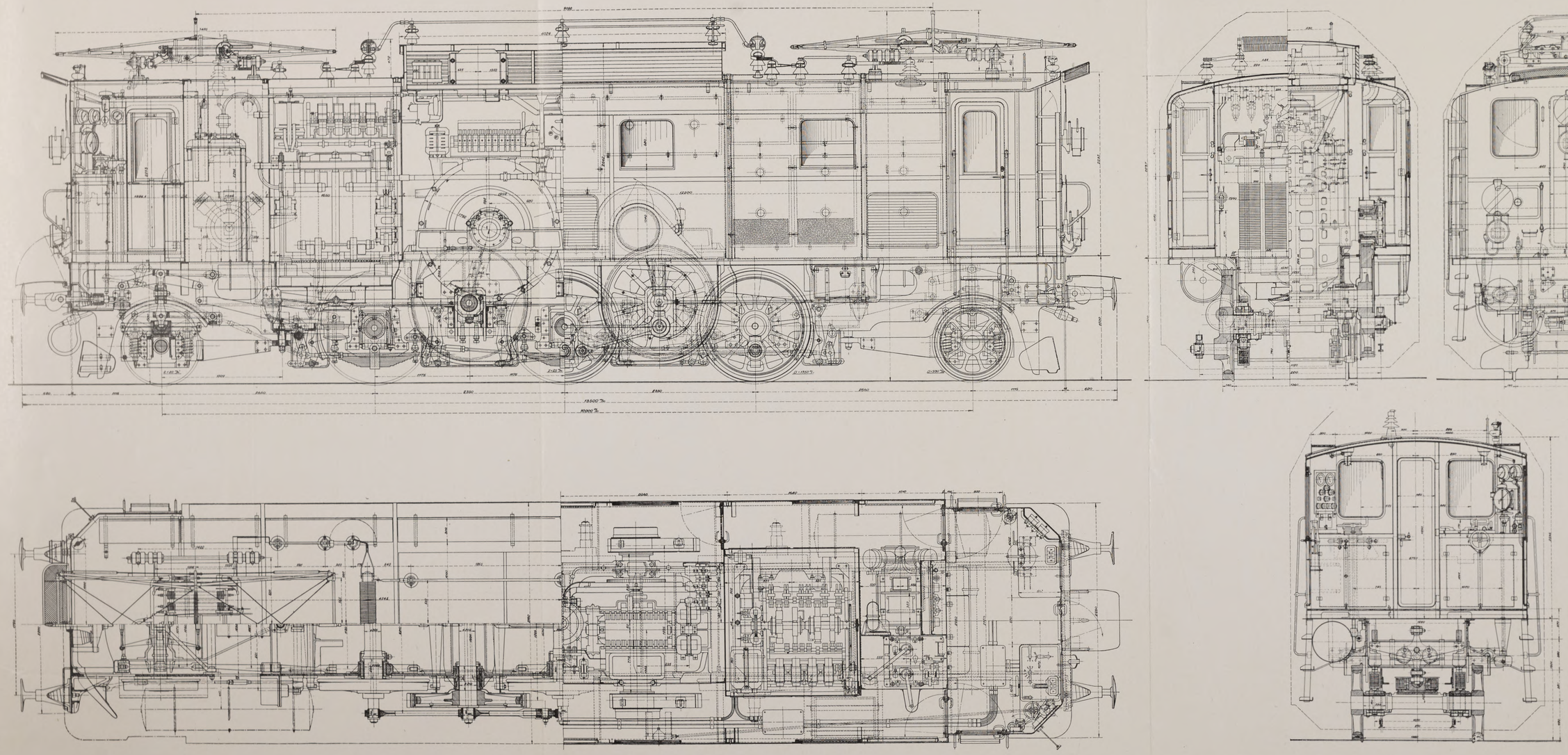

Oerlikon 15,000 Volt Single Phase Electric Locomotive (Type 2—6—2) for Express Service on the Gothard Line, Swiss Federal Railways.

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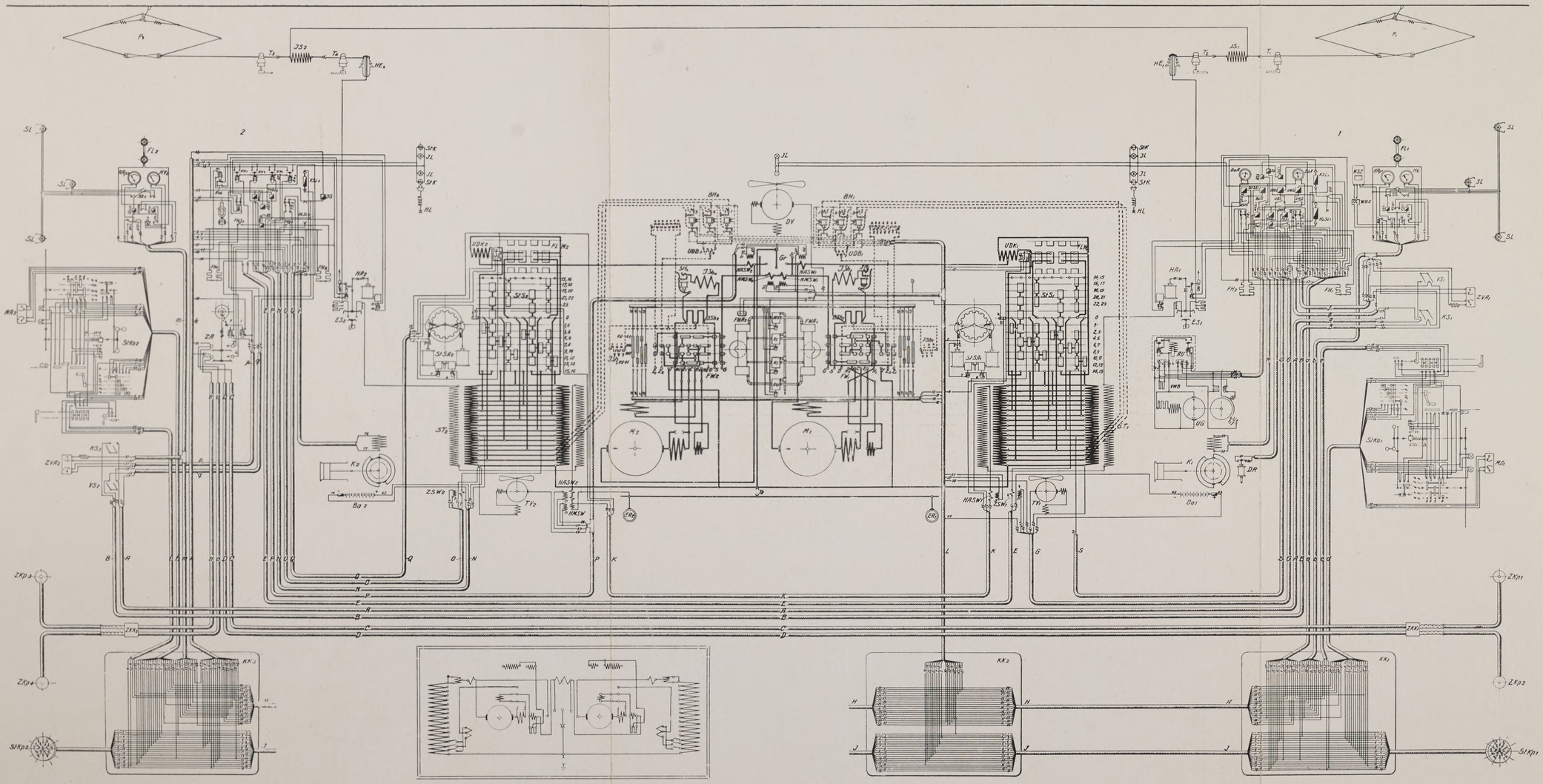

Plan of Motor Connections

Plan of Connections of Oerlikon Single Phase Locomotive (Type 2—6—2) for Express Service on the Gothard Line, Swiss Federal Railways.

High Tension.

ER	Earthing slipring.
ES	Earthing switch.
HA	Oil switch.
HASW	Current transformer in high pressure circuit.
HE	High pressure terminal.
HMSW	Instrument transformer in high pressure circuit.
IS	Choke coil.
P	Pantograph collector.
ST	Main transformer.
T	Isolating knife switches.

Low Tension.

BH	Electro-pneumatic contactors.
FLW	Alternative switching drum.
FW	Reverser.
KSW	Short circuiting switch for *NMSW*.
M	Traction motor.
NASW	Current transformer in low pressure circuit.
NMSW	Instrument transformer in low pressure circuit.
OSh	Auxiliary pole shunt resistance.
StS	Main controller.
TE	Earthing switch.
UDB	Reactance coil for electro-pneumatic contactors.
UDK	Reactance coil for main controller.

Auxiliary Apparatus.

AU	Automatic starter.
Ba	Accumulators.
DR	Pressure regulator.
DV	Ceiling fan.
FH	Driver's cab heaters.
K	Air compressor.
MV	Motor ventilating fans.
TV	Transformer ventilating fan.
UG	Motor generator.
ZA	Oil switch for train heating.
ZKK	Cable connection box for train heating.
ZKp	Coupler for train heating.
ZSW	Train heating transformer.

Switches and Fuses.

BaS	Battery switch.
DVSi	Ceiling fan switch.
FHS	Driver's cab heater switch.
FHSi	Driver's cab heater fuse.
HiSi	Auxiliary group fuse.
KS	Compressor switch.
KSi	Compressor fuse.
MVSi	Ventilating fan fuse.
RS	Spare switch.
TVSi	Transformer ventilating fan fuse.
UDS	Motor-converter dynamo switch.
UDSi	Motor-converter dynamo fuse.
UMS	Motor-converter motor switch.
UMSi	Motor-converter motor fuse.
US	Cut-out switch for compressor governor
VS	Ventilating motor switch.
IS	Instrument fuse.

Control.

FWA	Operating gear for reverser.
HStS	Main control circuit switch.
KK	Cable interconnecting box.
Ro	No-volt relay.
RoS	No-volt relay switch.
RH	Overload relay in high pressure circuit.
RN	Overload relay in low pressure circuit.
StKo	Operating controller.
StKp	Control coupler.
StSA	Main controller operating gear.
StSi	Control current fuse.
TS	Control current switch for *HA* and *FW*.

Lighting.

BS	Lighting switch.
BSi	Lighting fuse.
FL	Driver's cab lamps.
FS	Driver's cab lamp switch.
FSi	Driver's cab lamp fuse.
HL	Hand lamps.
IL	Motor room lamps.
ISi	Motor room lamp fuse.
SL	Signal lamps.
SS	Signal lamp switch.
SSi	Signal lamp fuse.
StK	Plug for hand lamp.
VWB	Lighting resistance.

Instruments.

BaA	Battery ammeter.
BaV	Battery voltmeter.
HAp	High pressure ammeter.
HV	High pressure voltmeter.
MA	Motor ammeter.
SpSt	Plug for movable heater.
StSt	Plug for watthourmeter.
WSZ	Watthourmeter.
ZVA	Train heating voltmeter and ammeter.

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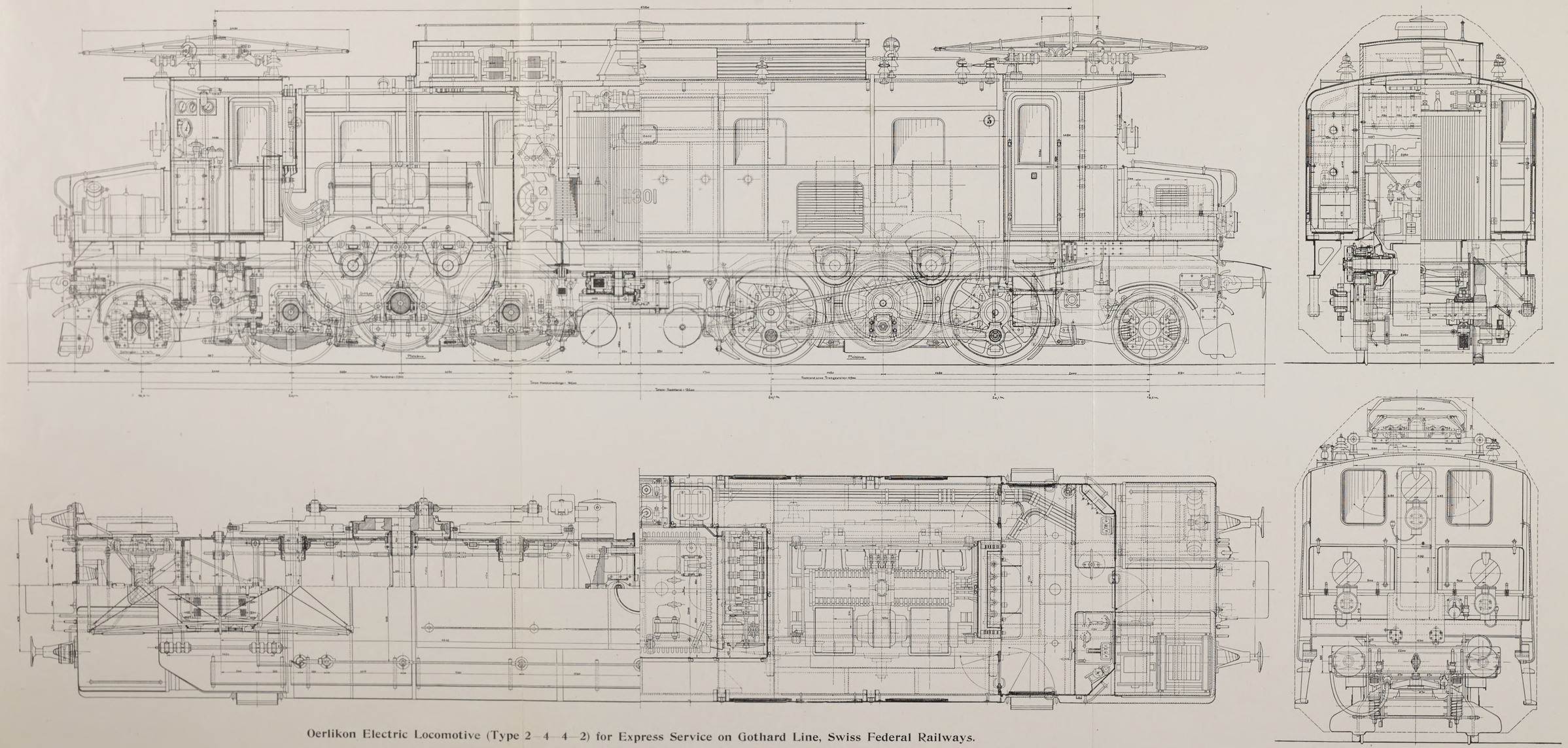

Oerlikon Electric Locomotive (Type 2—4—4—2) for Express Service on Gothard Line, Swiss Federal Railways.

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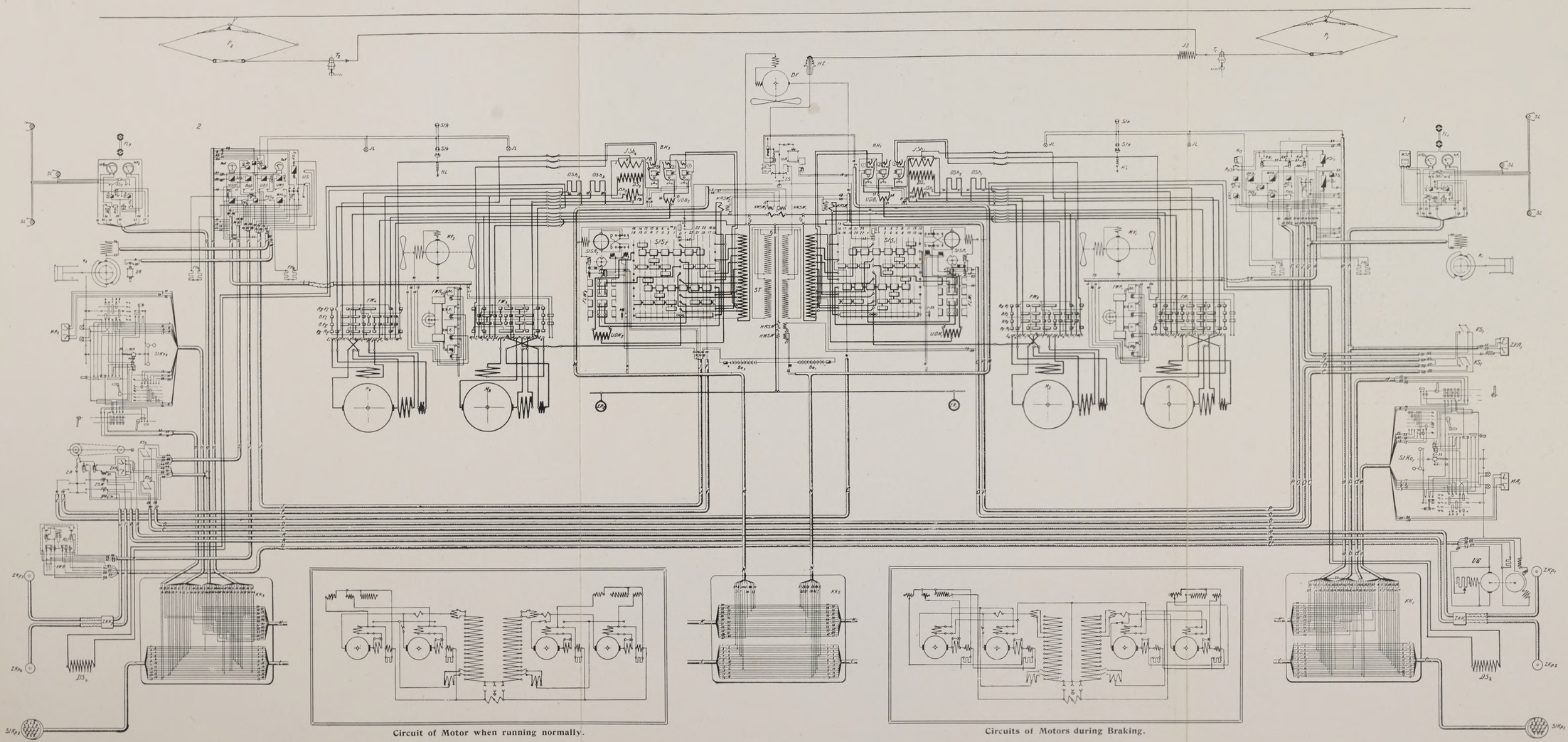

Circuit of Motor when running normally.

Circuits of Motors during Braking.

Plan of Connections of Oerlikon 15,000 Volt Single Phase Electric Locomotive (Type 2—4—4—2) Gothard Line, Swiss Federal Railway.

High Tension.

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ES	Earthing switch.
HA	Oil switch.
HASW	Current transformer in high pressure circuit.
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Low Tension.

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FH	Driver's cab heaters.
K	Air compressor.
MV	Motor ventilating fans.
UG	Motor generator.
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ZKK	Cable connection box for train heating.
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ZSW	Train heating transformer.

Switches and Fuses.

BaS	Battery switch.
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FHSi	Driver's cab heater fuse.
HiSi	Auxiliary group fuse.
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KSi	Compressor fuse.
MVSi	Ventilating fan fuse.
RS	Spare switch.
SMSi	Control motor fuse.
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Control.

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Instruments.

BaA	Battery ammeter.
BaV	Battery voltmeter.
HAp	High pressure ammeter.
HV	High pressure voltmeter.
MA	Motor ammeter.
SpSt	Plug for movable heater.
StSt	Plug for watthourmeter.
WSZ	Watthourmeter.
ZVA	Train heating voltmeter and ammeter.

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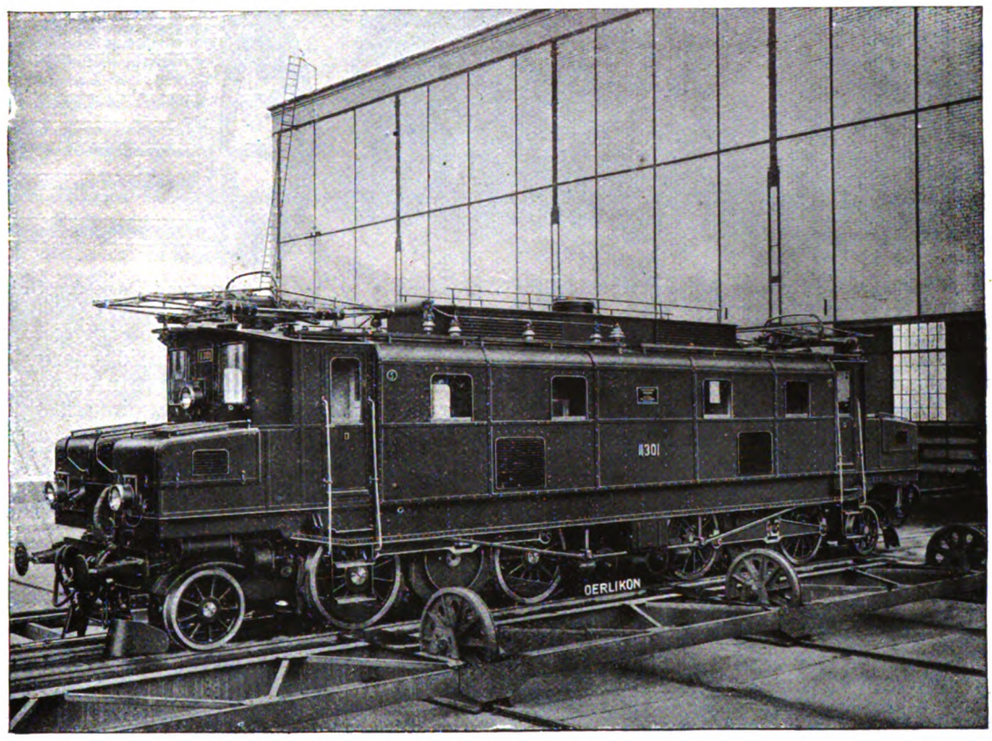
supports on springs arranged on the inside ends of the bogies. In contradistinction to the 2—6—2 locomotive the Bissel trailing axles have key guidance instead of springs. Each has two motors with reverser and cooling fan mounted directly on them, and placed relatively low and in between the driving axles. The drive is by means of a blind shaft fitted with gear wheels each end, and coupled to the driving wheels by connecting rods displaced 90 deg. The pinions are spring mounted on the motor shafts. The cooling air for the motors is drawn through louvres in the side of the locomotive body, which can be regulated pneumatically. Sliding covers are provided between the locomotive body and the bogies to prevent the ingress of dirty atmosphere.

The drivers' cabs are placed some little way back from the front of the locomotive, and the space in front is utilised to contain the auxiliary apparatus,



Electric Locomotive (2—4—4—2 Type) of Gothard Line—Swiss Federal Railways.

viz., compressors, converter, etc. The roof and sides are removable with the exception of the driver's cab for the easy replacement, repair, and adjustment of the electrical equipment. Each bogie is fitted with a brake cylinder operating the brakes in the usual way. Hand brakes are fitted, and only operate on their relative bogies.

These locomotives are fitted with one oil cooled step down transformer mounted in the centre, and reducing the line pressure of 15,000—7,500 volts down to the motor pressure. The two low pressure windings of the transformer are in series, and provided with 11 tappings each, which in conjunction with the controller gives 23 different speeds. The contactors are of the vertical type, and are operated electrically. The motors, which are provided with 10 poles, have a tractive effort at the wheels of 450 H.P. continuously and 560 H.P. at 1½ hour rating. The scheme of control is the same as the locomotive 2—6—2, including the operation of auxiliary apparatus, interlocking, and safety arrangements. Additional ventilation to that already mentioned is provided by fan blowers for motor cooling and a ceiling fan for transformer chamber.

This locomotive is also arranged for multiple unit control when two are coupled together. In addition a valuable feature has been included, in that it has been found possible to adopt regenerative electric braking.

RAILWAY ELECTRIFICATION.

A Technical Committee Now Sitting.

In a statement issued by the Ministry of Transport it is observed that the policy of the Ministry with regard to the electrification of railways is to encourage the different companies to spend their own capital on electrification schemes wherever a well-considered plan can be produced, more especially with regard to suburban traffic. This has proved in different parts of this country to be eminently suitable for electrification, and creates additional traffic with greater rapidity, so that the return upon the capital expended is improved.

There are, however, important points of principle to be settled, so that the various schemes which have been sent forward to the Ministry, both for suburban and for main line railways, shall be so arranged as to facilitate the continuity of traffic and permit the rolling stock of one company to go over the lines of all others. It is fortunate that up to the present very little has been done in this country which would interfere with the possibility of through running, as the necessary alterations, where differences do exist, can be made quite easily.

A committee of well-known technical engineers and others is at present sitting to consider the technical points in connection with the interchange of electric rolling stock and to advise on any questions which may arise in respect of through running.

The importance of early electrification in and about our great towns becomes much greater when all the housing schemes which are projected are taken into consideration.

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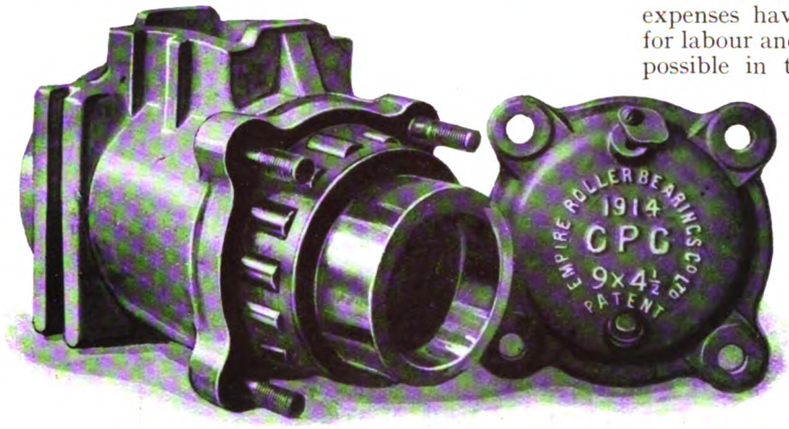
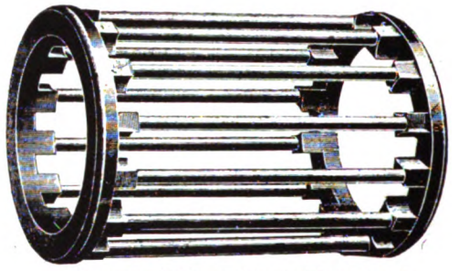
ROLLER BEARINGS FOR TRAMCARS.

In the days before the war the Empire Roller Bearings Company, of 13 Victoria Street, Westminster, London, carried on an extensive business in connection with the manufacture of roller bearings for tramway and railway rolling stock, shafting and general purposes. These bearings are favourably known at home and abroad for reliability and for friction reducing qualities.

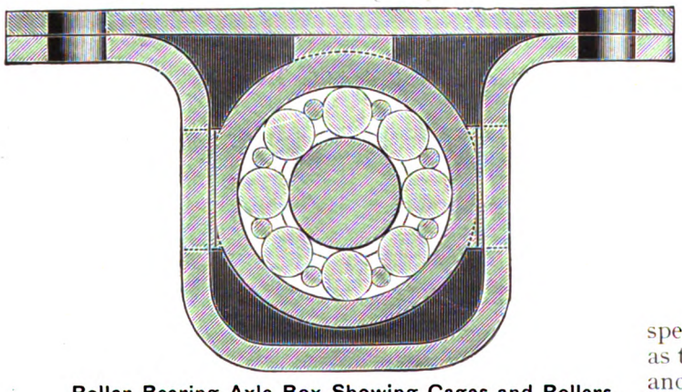
At the beginning of the war the company suspended business, as apart from Government work little could be done. Mr. Thomas W. How, M.I.Mech.E., the managing director, transferred for the time being his activities to the Ministry of Munitions as superintending engineer for S.E. and S.W. London. It is gratifying to learn that, the evil days of war being over, the company have resumed business, and are ready to execute orders. They have entered into close alliance with Messrs. Ransomes and Rapier, Limited, of London and Ipswich, for the manufacture of the bearings and for the development of the business. The chairman of Messrs. Ransomes and Rapier is Sir Wilfrid Stokes, K.B.E., the inventor of the Stokes gun. While his company manufacture the bearings the Empire Company are responsible for design and the embodiment of all the latest improvements, and attend to administration and sales.



Roller Bearing Axle Box for Railway Rolling Stock.



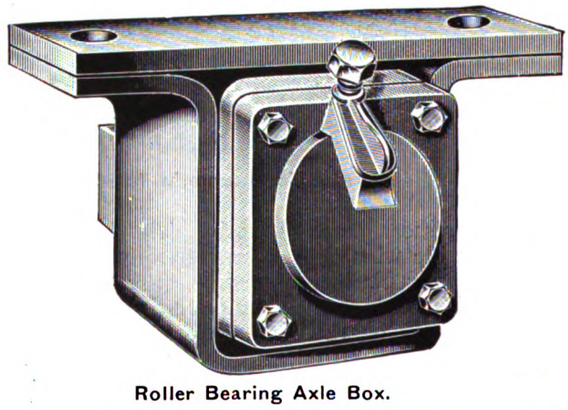
Improved Cage for Rolling Stock.



Roller Bearing Axle Box Showing Cages and Rollers.

The Empire Roller Bearings Company are the oldest established English makers of roller bearings, having in 1900 taken over the business of a pioneer company which was started in 1896. Having had 20 years' experience, they are prepared to give any reasonable guarantee with their bearings. Leaving out of account bearings for other purposes, it may be pointed out that this anti-friction device has been and is used both on railway passenger coaches and goods wagons as well as on tramcars. It has been applied to railway carriages which run up to 60 miles an hour, as well as to the slower vehicles on tramways. An example of the durability of the bearings is to be found in the case of high capacity goods wagons belonging to the Port of Calcutta Commissioners. The company began to supply their bearings to the Commissioners as long ago as 1906, and these bearings are still in use. Repeat orders from time to time have raised the number of roller bearings now in use at Calcutta to 3,400, the number of wagons fitted being 850.

In these days, when railway and tramway working expenses have become so high owing to heavy costs for labour and materials, it is essential to do everything possible in the way of economy. Various tests on tramways have shown a saving of from 15 to 20 per cent. and upwards in electric energy consumption when roller bearings were substituted for plain bearings. The reduction of the effort required to start the vehicle is of special importance in the case of a tramcar which has to start so often. The electric motors, when starting under load, take a heavy draught of energy, despite series-parallel control and rheostats. The advantage from reduction of friction is also felt during the whole time of running. The exact savings in specific cases were worked out some years ago, and are as true to-day as they were then. It is of some importance, especially in these days, that there is also a saving of more than 50 per cent. in lubricating oil for the axle bearings.



Roller Bearing Axle Box.

Connected with the reduction in starting effort is the more rapid acceleration of the car, while before the next stop is made "coasting" can be indulged in with a much less rapid diminution of speed, and thus over a longer distance.

The points which have been laid down and attained in connection with the roller bearing for tramcars are that it should be frictionless and of unquestioned durability, that it should be adaptable to existing types of underframes and axles, and that it should be

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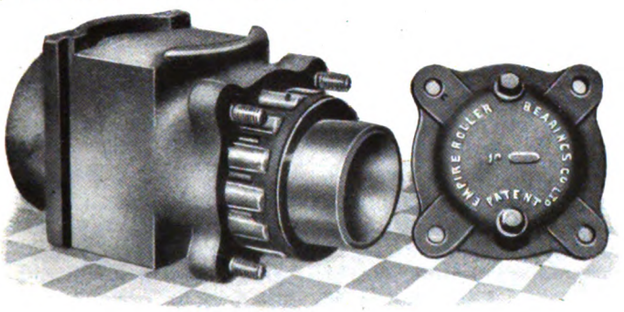
produced and sold at a price low enough to ensure its adoption and standardisation. As to durability, these axle-boxes have been in constant use on several tramway systems for upwards of 15 years with scarcely any renewal of parts. Railway wagons which have been running for ten years have required no renewals at all in connection with their roller bearings.

Of the appearance and construction of the bearings as used on tramcars and railway vehicles, the accompanying illustrations give a good idea. The outer casings are of cast-iron with spring bed central with the bearing and with guard grooves, designed to conform with all usual requirements. This casing is seated centrally on the top of a circular liner in such a manner as to have universal freedom of movement to conform fully with the varying line of the axle-guard and bearing spring. This arrangement ensures under all conditions of traction a perfectly free vertical movement of the axle-guards in the grooves and a correct alignment of load over the full length of the rollers and roller paths. Consequently the rollers have no tendency to run in winding, the work of the controlling cage is reduced to a minimum, the bearing has the highest efficiency and durability, and the vibrations of the car are very appreciably lessened by thus eliminating excessive rigidity, leverage strains, and resistance to free vertical movement between the car frame and the axles.



Roller Bearing Axle Box for Tramway Cars.

An alternative arrangement is used where the width of the axle-guard or frame openings and the height of the spring-bed are restricted. The spring-bed of the casing is slightly arched to ensure central transmission and correct alignment of load, and the axle-guard grooves are widened toward the bottom to prevent severe leverage strains from the axle-guard when rounding curves at speed. With this arrangement the casings are made of a special quality of cast-iron thoroughly chilled in the upper half of the bore and accurately ground, to form the outer path of the hardened and ground solid cylindrical rollers. Axle journals are fully protected from wear by hardened and ground steel sleeves pressed on, the outer surface of which is the inner path of the rollers.

The roller cages are of built-up steel, having end rings and spacing bars accurately finished. Each cage comprises a circular ring at each end connected by parallel bars forming a separate space to retain each of the set of rollers in true parallelism with the sleeved axle journal. It revolves freely around the sleeve with its rollers, and the load-bearing surfaces are subjected to a true and correctly aligned rolling action.

While these are the general arrangements, there is no difficulty in providing modifications to suit special forms of construction of the parts of the car concerned.

It is claimed that, even at present prices for everything, the use of these bearings results in such economies as practically to cover the whole prime cost of the bearings within the first year's service.

SAFETY CARS IN AUSTRALIA.

Reduction of Accidents at Ballarat.

Now that the "Safety First" campaign is becoming such an important feature of tramway operation, the results given below since the introduction of the one-man cars on the Ballarat tramways are of great importance. Mr. P. J. Pringle, the general manager, recently prepared particulars of all accidents reported as being due to passengers alighting or boarding the cars. This class of accident particularly brings out the value of one-man control, and a tabulated statement dealing with the same on one of the undertakings of the Electric Supply Company of Victoria is of considerable value.

In connection with this statement it should be explained that the one-man cars were introduced in May, 1913, and during this year they were installed on five routes of the Ballarat tramways. From May to July, 1915, they were put into service on a further two routes, so that the year 1916 and onwards show the full effect of the installation of one-man cars, which should be compared with the years 1911 and 1912, when there were no one-man cars in operation. An interesting comparison can also be made with the year 1913, when the one-man cars were first introduced. It will be noted that there were no accidents in connection with their introduction.

When all the one-man cars were in operation, the annual mileage of these cars was approximately 400,000, out of a total of 500,000, or 80 per cent. and 20 per cent. respectively. As the passengers per car-mile on each class of car do not materially vary, one would expect the following—That if all the one-man cars were in charge of conductors, the number of accidents reported under one-man cars in the statement enclosed would be approximately five times the numbers shown under the conductor column.

For instance, in the last four years there were 42 alighting accidents and 7 boarding accidents on cars in charge of conductors, and five times these figures would be 210 and 35 respectively. The accidents, however, reported from these cars when in charge of one man are 25 and 2 respectively.

Another convincing result of one-man operation is the fact that, since the introduction of the one-man cars on the company's two undertakings, the premiums insuring against third party claims have been reduced four times, the reduction in all totalling 40 per cent.

Comparison of All Accidents Reported Due to Passengers Alighting or Boarding Tramcars.

Year.	1911.	1912.	1913.		1914.		1915.		1916.		1917.		1918.		1919.	
	C.	C.	O.M.	C.	O.M.	C.	O.M.	C.	O.M.	C.	O.M.	C.	O.M.	C.	O.M.	C.
Alighting ...	47	40	0	62	6	39	7	24	12	13	7	12	3	10	3	7
Boarding ...	3	5	0	3	1	3	3	2	1	3	0	2	0	1	1	1

C.—Cars in charge of Conductor. O.M.—Cars in charge of one man.

From 1913 to 1919.

167 accidents alighting from conductor cars, 15 accidents boarding.
38 accidents alighting from one-man cars, 6 accidents boarding.

LONDON TRAFFIC REPORT UNDER CONSIDERATION.

In the House of Commons on April 26, Sir Eric Geddes, Minister of Transport, replying to Mr. Gilbert, said that the Government had considered the report of the Advisory Committee on London Traffic. While accepting the principle of the recommendations to set up a central traffic authority for London, they recognised that complicated questions of the relationship of the proposed authority to the departments of State and to local authorities were involved. These were receiving the close attention that they required. In reply to Mr. Kennedy Jones, who inquired why there was this delay, Sir Eric Geddes replied that it was because the report of the Committee over which Mr. Kennedy Jones had presided was very complicated and important, and required time for consideration. For the fourth occasion in fifteen years the London traffic problem had been officially considered, and he was now doing his best to hasten a decision.

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TRAMWAYS IN MESOPOTAMIA.

The Bagdad-Kadhimain Tramway.

For centuries the men of the East have dreamed of conquering distance by magic powers, and in their waking lives have plodded on through trackless wastes on horseback, on camel back, or footed it beside the patient ass. It is highly significant of the changes which time is working upon "the unchanging East" that a mode of travel so practical and so simple as the horse-drawn tramway car should find adoption in the home of Haroun-al-Raschid, the City of Bagdad.

The "Permanent" Way.

It may be necessary to premise, perhaps, that the war has contributed nothing to the tramway and little to our knowledge of it; but Mr. Chas. Burgess, general manager of the West Hartlepool Corporation Tramways, who, as Capt. Burgess, R.E., served with the forces from 1915, spending two and a half years in Mesopotamia, has sent us some curious photographs which give some idea of the local colour. Kadhimain is a small village situated on the right bank of the Tigris, about 4½ miles from Bagdad. In itself the village is of no importance, but it possesses a famous mosque, with golden domes, the burying-place of a great prophet of Islam. Hither come thousands of pilgrims every year to pay their homage to the sacred tomb. A syndicate of Bagdad capitalists conceived the notion that a tramway laid from Bagdad to Kadhimain would be a great convenience to the pilgrims and also yield a good profit to its owners. Accordingly a line was laid along the right bank of the Tigris, and equipped with horse-drawn cars. The track, as may be seen from one of the pictures, is very rough. The rails have been laid on steel sleepers; no paving is used, and the sun-baked earth is the only ballast. In all other respects the tramway has been adapted to the country. The car sheds are of "reinforced" construction, but instead of steel and concrete, the typical Arabian materials, mud, timber, and reeds are employed. In other respects, however, the Bagdad car service operates like any western city tramway. Two horses draw the vehicle along the lines, and in one of the photographs the car is seen starting from the terminus, the passengers seated, and the driver just about to step on to the platform. It is noteworthy that women passengers as well as women conductors seem to be unknown, the passengers being mostly typical "town" Arabs.

Car Shed at Bagdad.

The tramway is owned and operated by a Bagdad syndicate, and relies upon the pilgrim traffic for the major portion of its revenue. There are only two tramways in Mesopotamia, the Bagdad-Kadhimain and another horse tramway which runs between Kufa and Nejif. The latter place is also a holy town much visited by pilgrims.

In 1911 an electric tramway in Bagdad on the left bank of the river was projected, but not commenced.

Traffic Congestion.

The Terminus.

This district will, under settled conditions, probably develop considerably in the future, and offer scope for tramway pioneers.

Railway Fares.—Mr. Neal in the House of Commons recently said that as at present advised the Ministry of Transport did not intend to take any steps to effect a further general increase in ordinary passenger fares. The discussion on the London Electric, the Metropolitan District, the City and South London and the Central London Railway Companies Fares Bill are giving the House a convenient opportunity to consider the question of cheap fares for workmen, so far as the Metropolis is concerned, and whether any modification of the present system is desirable.

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MINISTRY OF TRANSPORT COMMITTEES.

Viscount Curzon, in the House of Commons on May 3, asked the Minister of Transport how many Committees have been set up by him, with what subjects they are dealing, what stage they have arrived at, and when they may reasonably be expected to report.

Sir E. Geddes, in reply, said that the Committees appointed by the Minister of Transport (not including committees or conferences of officials set up from time to time for departmental purposes) are as follows—

(1) Rates Advisory Committee.

This Committee was set up in October, 1919, in accordance with Section 21 of the Ministry of Transport Act for the purpose of giving advice and assistance to the Minister with respect to and for safeguarding any interests affected by any directions as to rates, fares, tolls, dues, and other charges or special services.

Reports from the Committee on Increased Charges for Demurrage, Increased Goods Rates and Charges, and on the charges to be made by the Thames Conservancy for services and accommodation provided by them, have already been presented to Parliament (Command Papers 526, 525, and 677 respectively). The general inquiry into the detailed revision of rates has commenced, and the first public sitting is to be held on May 11.

Light Railways Development.

In the meantime the members of the Committee have been asked in conjunction with representatives of the Ministry of Transport to undertake an investigation into the development of light railway operation and construction in the United Kingdom, and future policy with regard thereto, including a detailed inquiry into continental methods. The inquiry is proceeding.

(2) Roads Advisory Committee.

This Committee was set up in December, 1919, in accordance with Section 22 of the Ministry of Transport Act to advise the Minister and to safeguard any interests affected by the exercise of his powers and duties in connection with roads, bridges, and vehicles and traffic thereon.

The Committee has met, and has considered and approved the proposals of the Ministry of Transport for the classification of the roads of the country.

An Irish Sub-committee of the Roads Advisory Committee was set up in January, 1920, to deal with similar questions relating to Ireland.

(3) Railway Advisory Committee.

This Committee was set up in January, 1920, to advise the Minister with regard to technical questions as to railway working. The nature of the Committee's work does not involve the issue of reports

(4) Light Railways Advisory Committee.

This Committee was appointed in March, 1920, and will be called together under the chairmanship of the Minister of Transport or the Parliamentary Secretary as soon as sufficient matters of importance, either technical or financial, arise.

(5) Advisory Committee on London Traffic.

This Committee was set up in November, 1919, to advise the Minister in regard to such matters concerning London traffic as come within his province.

The Committee appointed a Technical Committee which met sometimes as a whole and sometimes in the form of one of the following sub-committees, (1) Sub-Committee on Traffic Regulation, (2) Sub-Committee on Improvement of Street Facilities, (3) Sub-Committee on Future Development.

The Advisory Committee have put forward various suggestions for the improvement of traffic conditions which have been approved by the Minister and brought into force. The Committee have presented their report, which has been laid before Parliament (Command Paper 636).

(6) Lights on Vehicles Committee.

This Committee was set up in November, 1919, to inquire and report on the codification and amendment of existing legislation and regulations with regard to lights on road vehicles, on the improvement of such lights and on other questions connected therewith.

The Committee has already presented two interim reports, which have been laid before Parliament (Command Paper 659).

The Committee has practically covered its terms of reference with the exception of the question of dazzling headlights.

(7) Taxation and Regulation of Road Vehicles Committee.

This Committee was constituted in November, 1919, to deal with the taxation of, and regulations as to registration, design, identification, and speed limits of, road vehicles, and with the effect of mechanically propelled traffic on roads.

The Committee has presented an interim report on the taxation of mechanically propelled road vehicles, which has been laid before Parliament (Command Paper 660).

(8) Channel Ferries Committee.

This Committee was appointed in December, 1919, to investigate the commercial possibilities of the system of channel ferries. A draft report will shortly be laid before the Committee for its consideration.

(9) Committee on Direction Posts and Road Signs.

This Committee was set up in December, 1919, by the County Surveyors' Society at the request of the Minister of Transport, to report on the question of direction posts and road signs, and on the extent to which they can be standardised. The Committee has reported, and its report is now being considered by the County Surveyors' Society, who will present their views on the report to the Minister of Transport in due course.

(10) Slippery Road Surfaces Committee.

This Committee was appointed in December, 1919, by the County Surveyors' Society, at the request of the Minister, to investigate the causes of the numerous complaints which have been received from horse owners and users as to the slippery condition of certain roads. An interim report is now ready for submission.

(11) Electrification of Railways Advisory Committee.

The Committee was set up in March, 1920, to advise the Minister whether any, and, if so, what, regulations shall be made to secure that future electrification shall be carried out to the best advantage in regard to interchange of electric locomotives and rolling stock, uniformity of equipment, and other matters. Also whether sections already electrified shall be modified so that they may form part of a uniform system.

The Committee commenced its sittings on March 22. A large amount of data available in connection with the reference to the Committee has been collected and considered, the lines of procedure discussed, and adopted, and certain other data required called for from the railway companies. This additional data is now coming in.

SPEEDS ON LEADING TRAMWAYS.

Replying to a question put at a recent meeting of Sheffield City Council, Sir Wm. Clegg, chairman of the Tramways Committee, said they were not prepared to reduce the speed of the cars. So far as could be seen, there was no necessity for any reduction. The speeds in the various large towns, for which figures were given in the annual accounts, were as follows—

	Miles.		Miles.
London County Council	8·89	Salford	7·80
Glasgow	8·18	Leeds	7·66
Sheffield	7·85	Bradford	7·3

It would be noted that in both London and Glasgow speeds are higher than in Sheffield.

In answer to further questions from Councillor Barton, the chairman of the committee said that eight fatal accidents had occurred in connection with the tramways since September 1, and 96 accidents causing injury to pedestrians. Since September 1 the total number of accidents of all kinds in connection with the tramways was 1,313. This number included vehicles running into the cars, omnibuses, tramway poles, etc., and also persons who had fallen or been injured by entering and leaving cars when in motion. The speed of the cars had been increased on only one route during the past six months, the increase being only ·7 of a mile per hour. So far as was known, no accident of any sort had occurred on this route since the increase in speed, and experience had shown that there was plenty of time to complete the journey without excessive speed.

KEARNEY HIGH SPEED SYSTEM.

It is reported that following a conference between the heads of various departments in the Ministry of Transport and Mr. E. W. C. Kearney, a full-sized demonstration of the Kearney high speed system will be arranged. The test line is to be a surface railway between Rottingdean and the road from the sea front to Ovingdean, and it will incorporate the essential features of the Kearney tube so far as the gradients, curvature, and speed are concerned. A speed of 60 miles an hour is to be attained for the level section. The car to be used has already been built by the Brush Electrical Engineering Company, and will shortly be ready for delivery. It has a seating capacity for 44 persons, and is equipped with two 35 H.P. electric motors. The diameter of the four under wheels are each 3 ft. and of the two guide wheels 11 inches. The weight is approximately 20 tons. The whole of the weight of the car will be carried by a single ground rail of the standard flat bottom type, weighing 75 lb. per yard.

Edinburgh Corporation Omnibuses.—The Corporation are at present running seven single-deck omnibuses and the number will be increased to twelve within a few weeks. The vehicles are at present being used on an entirely new route within the city, and the receipts average 26d. per omnibus mile. Sixty additional omnibuses have been ordered, and beginning with June 1 four of these vehicles will be delivered each week. It is anticipated that the whole number will be delivered before the end of the summer.

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LONDON, MAY 13, 1920.

The End of Grants to the Rates.

A transformation has been effected in the finances of tramway undertakings since at the annual conference of the Municipal Tramways Association of 1915 Mr. Alfred Baker related the timorous steps taken at Birmingham to raise the fares from their pre-war level in something like a proper ratio to expenses. Mr. Baker's suggestion that times were changing, and that tramway authorities would be well advised to consider the question of fare revision without undue delay met with some lively criticism; but time has justified the warning. Everywhere the scale has now advanced, and in most cases to the limit of the statute; and Parliament has had to be invoked. The new Bill, which, as read a third time and passed by the House of Commons in April, will enable municipal undertakings to levy such charges as will enable them to be carried on without loss. Companies are to be allowed to raise fares to an extent that will permit of payment of the interest on loan capital and a reasonable return on share capital. Even Glasgow, which city three years ago celebrated the extinction of its tramway debt, has to follow the universal example in order to avert a charge on the ratepayers. In view of these circumstances it is not surprising that Manchester Corporation on April 21 postponed for a year their consideration of the tramways department's contribution to the rates, which has hitherto been fixed at 5 per cent. on the aggregate capital outlay. Two years ago the department asked for a reduction of the contribution to 1 per cent., and now that the tramways are being worked at a heavy loss a grant to the rates is impracticable. Indeed, it would appear, in view of the condition which Parliament has attached to the power to increase fares, that such a payment would be illegal. In the present financial position of all undertakings the all too small renewals fund is being depleted by the need for track reconstruction and the acquisition of new cars—the dual legacy of the war. The resulting deficit on those accounts and also on the cost of operation can be met only by higher fares, or by a rate in aid. Under these circumstances it is astonishing that Leeds and Liverpool Corporations have recently referred back to their Tramway Committees proposals for revision of fares. Leeds tramways are working at a loss of £300 per day, and at Liverpool there is a loss of 2d. per car-mile, while the department's omnibuses are faced by a deficit of £27,000 per annum. With a continuance of the present fares, it appears inevitable that the undertaking will be on the rates at the end of the present year. No doubt the Labour party would view that contingency with equanimity, especially as not far short of a million sterling has gone to the relief of rates since electrification; but Alderman F. Smith put the case in a correct light when he said that the working man was not a pauper, but was able and ready to pay for his ride at the new charge of a penny per mile. If that were not the case there would be small hope for the continuance of tramway services, because in these days of enormous taxation ratepayers are in no mood to distribute doles in the form of subsidies for travelling facilities. The position will be serious enough if they are not allowed to make even a modest profit from the undertakings which their guarantee has enabled to be set up; and the least that they have a right to demand is that every tramway passenger shall pay full value for his ride, whatever that may be.

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The Tramway Fare Bill and the Industry.

Tramway shareholders, probably the most unexacting investors in the country, will no doubt view with satisfaction the passing by the House of Commons of the Bill designed to enable tramway companies to meet their obligations and to pay dividends. The workers are in process of having their demands satisfied, and this would clearly not have been possible were the companies to obtain no relief from their present inability to raise fares above the now insufficient statutory maximum. Yet shareholders should moderate any anticipatory exhilaration in which they may be inclined to indulge. In the past they have been public benefactors, and the Bill is not likely to alter their status to any large extent; their money will continue to be used for the general good, and their dividends to be of very modest proportions. Indeed, with increased powers of charging the problem of securing a profit may in some cases be no less difficult than it is at present; for after having raised fares it will be necessary to maintain traffic, and there are indications that in the hard times that must certainly be encountered this will be no easy task. It is, however, satisfactory that the Government have at length recognised that tramway companies cannot be compelled to raise wages without opportunity to obtain earnings wherewith to pay them. It is also encouraging to note that the Ministry of Transport take a true view of the utility of tramway enterprise, and is likely to act with intelligent appreciation of the fact that the industry sadly needs encouragement. No other industry has been more deeply affected by the conditions arising out of the war. During the war the physical condition of tramway property depreciated beyond estimation, and its condition to-day is deplorable. Prices are now such that reconstruction can only be effected at enormous cost, and extensions are being blocked all over the country because of the large capital required for them. Many of these extensions are, however, urgently required, and must be made if the public welfare is not to suffer. Production is the pre-eminent requirement, and transportation is closely allied to production; new industries and new houses are impracticable without means of travel. It is therefore of urgent importance that the condition of the tramway industry should be so improved that capital will be attracted to it. Whether this will be the result of the new legislation remains to be seen. With all its limitations the Bill can hardly fail to effect some improvement; and by the time it lapses it may be hoped that the most difficult period of tramway history will have passed.

Initial Efforts of the National Council.

The National Industrial Council for the tramway industry is not having an easy initiation. Neither employers nor employees are pleased with it. Its decisions have been flouted by municipal authorities and by isolated bodies of the workers, although not supported by their unions. The Council has, of course, no power to enforce its decisions, and when these have been rejected it has wisely resumed negotiations in the hope that ultimately a conclusion might be reached acceptable to both parties. In difficult circumstances the temper of both sides has been excellent; and gradually a workable basis will we hope be attained. In the long run, we venture to think that the Council will make for better organisation and a truer understanding between employers and employed. Clearly, without the Council the employers would not have received so strong an impression of the justice of the men's demands for higher pay. That so generous a concession as 5s. per week, in addition to the increase in October last, was made is evidence of the ability with which the men's case was put. That the men in a few places broke away from the agreement is no fault of the Council. Had the authorities concerned—i.e., the tramway committees and the Town Councils—remained firm, the recalcitrants would soon have been brought to reason. There was some excuse for the employees, unused as they are to the degree of power of which they now find themselves possessed; but there is little to be said in extenuation of the weakness shown by some authorities. If they felt that the Council should have granted the men more, their proper course was plain; there are legitimate means for reopening any question. The whole difficulty arose from the insistence of the men's representatives upon a uniform national settlement. In an industry so diversely conditioned as are

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tramways it is impossible for all undertakings to pay at the high rate which may be feasible in the larger cities. Consequently the only method for dealing with wages is by means of local inquiries such as have recently taken place, the National Council having remitted the matter to the District Councils. Progress is thus being made; but it will not be surprising if there are further disagreements. Both sides have something to learn. No legislative scheme ever worked smoothly from the outset; and where one side is a novice in the art of give and take some time must elapse before a due sense of responsibility is inculcated. In the meantime let us not despair of the Whitley Council. That it has worked as well as it has done so far is due in no small measure to the unwearied efforts of the secretary of the Municipal Tramways Association, Mr. J. Beckett, whose persistence, patience, and tact on more than one occasion prevented the negotiations from breaking down.

The One-man Safety Car.

Some notes on the use of small cars in France, which appear on another page of this issue, may serve to emphasise the question whether our almost total adherence to larger cars is altogether justified. That question has, we believe, already received a good deal of attention in this country, and if circumstances were more propitious experiments would probably be undertaken without delay with the object of ascertaining whether American results with small cars could be equalled here. There is no denying the unqualified success of what is termed the "one-man safety car" throughout the United States. It has proved the salvation of more than one undertaking faced with motor vehicle competition and the ever mounting costs of operation. Working expenses have been cut down, faster services have been given, and what is of even more importance the number of accidents has largely diminished. These are important results, and justify the most careful consideration of managers and committees. There are well-known reasons why in many cases the double-deck bogie cars are indispensable; but in other cases there are better reasons for the use of the small car. Indeed, in some cases where the former seems the only suitable car it is just possible that reconsideration of the matter may discover that it is not so. In the United States the one-man car, at first scouted as impracticable for heavy traffic, is now used in the largest cities. An expert report that has recently been made upon New York railways advises the introduction of the one-man car to carry the twenty-four hour base load of the system. It is suggested that ultimately five hundred such cars will be needed, and that they will produce an annual saving equivalent to £80,000 nominal. While the small cars would provide for the base load, sufficient ordinary two-men cars would be retained to cope with the peak loads by so much as these exceed the capacity of the small safety cars regularly in service. Questions sent out by the American Electric Railway Transportation Association elicited replies showing that 96 per cent. of the communities are in favour of the safety car, and the employees also seem to share this opinion. For the benefit of the London County Council it may be mentioned that the superintendent of car equipment of the New York railways has found the one-man car adaptable to the underground conduit system. A type of car that has proved a money saver throughout a country so diversified as the United States can hardly fail to be applicable to at least some tramway systems in this country, and it may be expected that some enterprising British manager will before long make a practical test of the new type. His colleagues will await the event with interest.

OVERHANGING TREES.

Unusual circumstances attended the payment by Johannesburg Municipal Council of £2,000 to a man who lost the sight of an eye owing to an accident while a passenger on a tramway car. The mishap was due to a tree brushing against the top deck, striking him as he sat in his seat. The Tramways Committee reported that they had been advised that the other eye was affected, and on an examination being made their medical officer reported that the sight of the other eye was limited to five-ninths of the normal. The claim originally was for £4,500, but the passenger's solicitor offered to settle, without prejudice, for the sum already mentioned. That amount was voted "in full and final settlement of the claim." The case is not without interest for other tramway and also omnibus undertakings. It is the duty of owners of trees to keep them from becoming a danger to traffic. In case of neglect the local authority can demand the removal of the obstruction, and, if necessary, carry out the operation. Such action has been taken in the Metropolitan district and elsewhere at the request of the London General Omnibus Company. There have been occasions when in cases of delay the company's employees have been seen undertaking the task, the men working from the top of an omnibus. In the case of lamp-posts situated too near the edge of the kerb disputes have arisen between a local authority and the company. While the former have attributed collisions to the overhanging of the top deck, the company have complained that the road has too pronounced a camber. This is a matter that ought to come under the cognisance of the Ministry of Transport, at least on main thoroughfares.

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ELECTRIC TRACTION IN AMERICA.

PRELIMINARY REPORT OF FRENCH COMMISSION BY M. MAUDUIT, MEMBER OF THE COMMISSION, REPRESENTING THE MINISTER OF PUBLIC WORKS AND TRANSPORT.

The French Ministry of Public Works appointed a committee on November 14, 1918, from among the members of the higher Council to investigate the different projects of the Paris, Lyons, and Mediterranean, the Orleans and the Midi Railway for the electrification of about 10,000 kilometres (6,200 miles). This committee was composed of the best qualified technical men of the Ministry and of the railways concerned, and they recommended that a commission should be sent to the United States in order to collect full information upon the recent progress of electric traction in that country. This commission included thirteen members. The majority left Paris on April 15 for America, and returned on July 22, 1919.

On arrival at New York on April 25 they visited representative construction works and railway companies, as well as the following electrified lines—

New York Central, continuous current installation, 600 volts, third rail.

New York, New Haven and Hartford, monophase installation, 11,000 volts, 25 periods.

Pennsylvania Railroad and Long Island Railroad continuous current installation, 600 volts, third rail.

These are all suburban railways, but at the same time they carry considerable goods traffic. The party also visited a number of electric power stations of the Interborough Transit Company and the Edison Power Company at New York, as well as the hydro-electric station at Niagara and another coal station at Buffalo. From May 8 to 10 we visited the works of the General Electric Company at Schenectady (New York), and discussed with the principal engineers of this company the questions of electrification of railways in general, but particularly that of the continuous current high tension (3,000 volts) installation of the Chicago, Milwaukee and St. Paul Railway, which was carried out by this company.

From May 11 to 25 an inspection was made of the following railways—

Norfolk and Western Railway, monotriphase, 11,000 volts, 25 periods (Bluefield to Vivian, Virginia).

Pennsylvania Railroad (Philadelphia to Paoli), monophase, 10,000 volts, 25 periods.

Baltimore, Washington, and Annapolis, continuous current, 1,200 volts; the locomotive construction shops of the Baldwin Company at Philadelphia, and the repair and construction shops of the Pennsylvania Railroad at Altona.

From May 25 to 28 the party visited the workshops of the Westinghouse Company at Pittsburg, and discussed with the engineers the question of electrification in general, and particularly the monophase and monotriphase installation set up by this company, and the new continuous current locomotives destined for the extension of the electrified portion of the Chicago, Milwaukee and St. Paul Railroad.

From May 29 to June 4 the locomotive shops of the General Electric Company at Erie were inspected. Discussion followed upon the automatic tramway sub-stations designed to provide continuous current at 600 volts, as built by the Westinghouse and by the General Electric Company. The Electric Railway of Chicago, Lake Shore and South Bend, monophase, 6,600 volts, 25 periods.

INVESTIGATIONS IN THREE COUNTRIES.

From June 5 to 14 we made a detailed study of the Chicago, Milwaukee and St. Paul Railway, including the section now working between Harlowtown and Avery, 710 kilometres (the Rocky Mountains), the section now under construction from Othello to Tacoma and Seattle, 360 kilometres (Cascade Mountains), the whole with continuous current at 3,000 volts; the repair shops and depot at Deer Lodge (Montana). A visit was also paid to the three main hydro-electric generating stations of the Montana Power Company, which provides current at 100,000 volts triphase at 60 periods to this railway; the 35,000 kilowatt station at Rainbow; the 48,000 kilowatt station at Great Falls; the 48,000 kilowatt station at Holter, all of which are on the Missouri River.

The commission separated at Seattle on June 15, and a few of the members continued their investigations by visiting other electric railways and a certain number of high voltage power distributing systems, in order to obtain information required for future organisation in France.

The following installations were examined—

Central California Traction Company, a line of 72 kilometres from Stockton to Sacramento in California, equipped with an inverted third rail carrying continuous current at 1,200 volts, the sole example of the use of a third rail for so high a tension in America.

The system of the Pacific Electric Railway, suburban and interurban tramways in the neighbourhood of Los Angelos at 600 volts and 1,200 volts continuous current.

Puget Sound Light and Power Company, the Central Water Power generating station, and the White River, near Seattle (Washington), 48,000 kilowatts, 55,000 volts, height of fall 130 metres.

Utah Light and Power Company sub-station at Salt Lake City, 25,000 kilowatts.

Great Western Power Company of San Francisco (California), hydro-electric station at Las Palmas (California) upon the Feather River, 65,000 kilowatts, 115,000 volts, height of fall 138 metres. Power is conveyed by a double aerial line upon poles to the sub-station at Oakland, a distance of 246 kilometres.

Pacific Gas and Electric Company at San Francisco, steam power station with oil-heated boilers, 57,000 kilowatts.

The Southern California Edison Company of Los Angelos, two hydro-electric stations near to one another at Big Creek, in the Sierra Nevada, each of 28,000 kilowatts, 150,000 to 160,000 volts, height of fall 600 metres. Two lines of steel and aluminium constructed on separate posts covering a distance of 400 kilometres, receiving station at Eagle Rock near Los Angelos, regulating by synchronating motors.

Besides the main duty of the commission, which was to collect all the documents that might be of use in the electrification of the French railways and high tension distribution of the electric energy, it was desired to learn whether there were undoubted advantages attached to any one system of electrification such as to point it out as the best for the contemplated electrification in the centre and south of France. All the four systems of electric traction are in use on great lines, that is to say, the monophase, the triphase, and monotriphase, and the continuous current at high tension. The triphase had already been studied in detail in Italy, where it is employed on a large scale, while it has not been installed to an appreciable extent in any other country. The monophase had been examined already on the electrically worked lines of the Midi in France and of the Loetchberg Company in Switzerland, as well as the Swiss Federal Railways, which have adopted this system for the progressive electrification of all their lines, and it is just now being employed upon the Gothard Railway.

The monotriphase and the high tension direct current systems are only to be found in America, and were bound to receive the greatest attention from the commission. At the same time the examination of American monophase lines, which are all worked with 25 periods instead of the 16 common in France, enabled the study of this system to be completed.

Information of every kind which we have been able to collect in America will be included in a detailed report, which will be presented to the Government. This will serve as a basis for the discussion as to which system should be adopted in France. The object of this preliminary report is merely to give the most important impressions which the authors received after investigating American experiences. The documents have been collected by all the members of the commission, but the opinions in this preliminary report, although they have been influenced by the general feeling of the commission, are only to be regarded as personal opinions until they have been approved by the whole commission for the final report.

SOME MONOPHASE DIFFICULTIES OVERCOME.

The principal lines equipped with this system (25 periods and 11,000 volts) are sections of the New York, New Haven and Hartford Railroad and the Pennsylvania Railroad. These, as we have said, are only suburban lines, but are interesting, since the system can equally be applied to main lines, and is similar to that already working in the South of France.

The New York, New Haven and Hartford Railroad is electrified over 63·24 miles of line. The step was decided upon by New York State, and it includes one part working at 600 volts direct current with inverted third rail running over the main line of the New York Central Railroad at its entrance into New York. The outer portion is on the monophase system at 11,000 volts with overhead wires. The necessity for each locomotive to work at 600 volts direct and 11,000 volts monophase seriously complicates their equipment.

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The traffic is fairly heavy, and the technical working has been satisfactory since a number of difficulties of the first few years have been overcome. These difficulties consisted in the first place of the danger of accidents being brought about by short circuits, which frequently occurred from the overhead line or on the feeder cables and from the disturbances introduced in telegraph and telephone wires in the neighbourhood. Means have been found to solve these difficulties, but only by the use of complicated, delicate, and expensive apparatus. The telephone wires have been buried in leaden pipes. The distribution of energy is effected at 22,000 volts, and the use of 30 compensating transformers divided along the 63 miles of line so as to diminish the fall of tension along the line and thus reduce the induction on the telegraph and telephone wires; this arrangement replaces the sucking transformer of the French Midi Railway, with the additional advantage of a reduced fall of potential.

The rolling stock consists of 103 locomotives and 26 motor cars. The cost of upkeep is relatively high, and the *personnel* of the repair shops numerous. The monophase motors are delicate, and require considerable attention. The Pennsylvania Railroad controls the route from Philadelphia to Paoli, a length of nearly 20 miles with four tracks, and that from North Philadelphia to Chestnut Hill, a distance of about 12·5 miles with double track. On this route there are only motor cars, and the service is of a heavy suburban type. The mechanical arrangement is good, for the motors require to work both on direct and monophase current. They are of a more modern type with better commutators.

Special precautions are taken against short circuiting, and the effect of telegraph and telephone cables has been minimised by burying these cables in leaden tubes. Feeder transformers are employed at frequent intervals (five for 32 miles of line), and sucking transformers are introduced upon the track at very short intervals in some places. Under ordinary circumstances the signal lines work quite satisfactorily, but short circuits, which are rare, produce serious disturbances.

PROBLEMS STILL TO BE SOLVED.

A very interesting registering device is inserted in the cable circuit, and allows compensation for the distributing induced voltage at any moment in the telegraph and telephone wires. The high frequency adopted for American electric traction (25 periods per second instead of the 16 usual in Europe) has been necessitated by local conditions, in order that the numerous supplies of energy at this frequency might be employed. For this reason, and also on account of the motors, which are sometimes not quite so satisfactory as those which we have seen in the South of France and in Switzerland, it may be said that electric traction is not so far perfected in the United States as in Europe. None the less the precautions taken against the induced disturbances in telephone and telegraph lines have reached a considerable degree of perfection, and the catenary suspension of overhead wires is well carried out.

When we compare the position in France, in Switzerland, and in America, we are led to believe that the monophase system is far from perfection, and still offers a number of problems which are not yet satisfactorily solved. Such is the design of a motor capable of remaining for some time under current without turning, so as to be able to start a heavy train on an up gradient, and recuperating electric braking. Furthermore, the system leads to serious complications in an endeavour to protect neighbouring telephonic circuits, which cause a considerable increase in first cost, although apart from this the cost is considerably below that of the triphase and direct current system. The maintenance cost of the motors has been higher than of these two systems, and the motors are more frail and cannot take such heavy overloads.

THE MONOTRIPHASE SYSTEM.

In the monotriphase system, which Americans call "split phase," monophase current is supplied by a single overhead wire, as with the monophase system, and the return is through the rails. This, however, is transformed upon the locomotive by means of a special transformer into triphase current, and the motors actuated by the latter are of the triphase induction type.

The object of this arrangement is to benefit by a single contact wire of the monophase system (the Italian triphase system requires two aerial contact lines as well as the ground rail for return) and also by the strong and economical triphase induction motor, which can remain under current for several minutes without turning, and thus ensures the starting of the heaviest trains in a way which the ordinary monophase motor has not yet been able to do.

At the present time there is but a single line working upon this system. It is that of the Bluefield to Vivian section of the Norfolk and Western Railway, in the Appalachian Mountains in Virginia and West Virginia, over a length of 30 miles with double or treble track, numerous currents and steep gradients.

An electric locomotive will pull trains of 3,000 tons mainly loaded with coal at a speed of 14 miles per hour, only requiring assistance on slopes steeper than 15 millimetres per metre. These locomotives can work at very different loads and do not give much trouble, but their operation presents a few mechanical and electrical faults, which have not been satisfactorily corrected up to the present. This installation must therefore be looked upon as only in a period of trial; at present the maintenance cost of the motors is higher than any other system. From a mechanical point of view the transmission of power from the motors to the axles, which takes place by means of horizontal connecting rods, causes rapid wearing of the bearings and even a loosening of the whole frame, or a breakage of the connecting rods on account of the enormous power developed when the frame rises or falls.

From the electric point of view the principal disadvantages are the following—The triphase current produced by the present transformer is not perfectly symmetrical, and the phases are not produced by equal current; at the same time the rotors of the motors being governed by different liquid rheostats, the charges are never equally distributed between the motors, and there is often a considerable difference. It is true there is an arrangement for adjusting these charges by hand, but as the motorman is very busy he cannot often attend to this adjustment properly in practice, and the motors often running at an overload deteriorate rapidly.

The efficiency is low on account of the presence of the induction transformer, which adds its magnetisation needs to those of the motors. To remedy these various faults, with the exception of the division of charge between the motors, the designer is now working out a synchronising transformer on high efficiency which will give a more symmetric triphase current. This new apparatus has not yet been tested, and there is a fear that it may not resist the shocks experienced on the line. Owing to the numerous repairs that are necessary, and to the lack of electric locomotives due to the war, the working of the trunk line from Bluefield to Vivian still requires many steam locomotives. The Pennsylvania Railroad is also considering an application of the monotriphase system to the four-track line from Altona to Johnstown, upon the Philadelphia-Chicago line. A trial locomotive is now being tested, but no permanent line work has been set up. The monotriphase, whose principle at first seemed very interesting, was thought likely to be of much help to the monophase system by employing motors working on the monophase for fast or light trains, and monotriphase locomotives for slow and heavy trains, both of which classes could be supplied by the same overhead line. In practice, however, numerous faults have been found, which it has not yet been found possible to correct, so that the system has not fulfilled the expectations which had been aroused.

HIGH TENSION DIRECT CURRENT.

For some time now direct current at 600 volts has been used as a standard form for urban and suburban electric traction, either with overhead wire for tramways or with third rail for suburban railways (as in the line from the Invalides to Versailles and from Paris to Juvisy).

In the United States the majority of the interurban lines are worked by continuous current at 1,200 volts with overhead wires. A number of these lines are practically railways carrying goods and passengers, and often reaching speeds of 35 to 50 miles per hour. Some lines which were originally equipped for monophase at a tension between 3,000 and 6,600 volts, had been changed to direct current at 1,200 volts. The rolling stock corresponding to this voltage has now also been standardised, as has that of the 600 volt tramways.

Encouraged by the satisfactory working of these installations, the Americans have tried, and with complete success, to raise the potential for continuous current to 2,400 volts, and the mining line from Butte to Anaconda on the Butte, Anaconda and Pacific Railway (Montana), has been equipped in this way along 32 miles of single track. Then the greatest electrification of the world, a distance of 440 miles from Harlowtown to Avery, has been carried out at 3,000 volts through the Rocky Mountains and the region of Misoula, upon the Chicago, Milwaukee and St. Paul Railway.

The electrification of a second trunk line of 222 miles, between Othello and Tacoma-Seattle as far as the Pacific, is in course of construction, and will be working before the end of the year. The remaining portion, between Avery and Othello, of about the same length, has also been decided upon.

The commission studied the installation of the Chicago, Milwaukee and St. Paul Railway with particular care, and all the members agree that this electrification—by far the most important which has yet been effected—was at the same time superior to all others for the excellence of its equipment from every point of view. Electric energy is supplied by the Montana Power Company in the form of triphase current at 100,000 volts, and transformed to direct current at 3,000 volts in rotary sub-stations containing motor generators, in which a synchronised motor and two continuous current dynamos are mounted upon the same shaft and coupled electrically in series, so that each develops only 1,500 volts on its commutator.

These sub-stations are the most delicate and the most expensive part of this system of traction, but there are only 14 along the 440 miles, approximately one for 30 miles, and they are found to work very satisfactorily. Each requires a staff of three men, the chief and two assistants for permanent work, producing a power of 4,000 to 6,000 kilowatts. By the use of protective arrangements upon the commutator and of extra rapid circuit breakers in the main

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circuit it has been found possible to avoid accidents from that most dangerous form of continuous current work, the flashing at the commutator in the event of a short circuit. The excellent arrangement of the sub-stations is largely responsible for the success obtained by the continuous current high tension system.

FURTHER ADVANTAGES OF H.T. DIRECT CURRENT.

In view of the comparatively weak potential along the conductor (3,000 volts instead of 11,000 or 15,000 required by the monophase system), a considerable flow of current is necessary for the traction of heavy trains. Experience has shown that with a double contact wire and a pantograph arch with double shoe and quadruple contact, it is easy to collect 1,500 to 2,000 amperes at a speed of 80 to 96 kilometres per hour, and 4,000 amperes at a speed of 25 kilometres, which is more necessary for the heaviest trains.

The locomotives are very easily driven and work perfectly, the series motor for continuous current being the ideal motor for traction purposes, as has been shown for a long time in tramway and suburban electric railway work. They are provided with a wonderfully efficient recuperating brake, which allows the easiest running upon slopes, and is the cause of a considerable saving of current, and above all of tires and brake shoes. A single winder with an assistant is sufficient for the upkeep of 336 motors of the 42 locomotives in use. The old depot for steam locomotives at Deer Lodge, corresponding to 223 miles of line, has been ample for the needs of the electric locomotives and their repair shops for the complete length of 440 miles, which has been electrified. A single locomotive draws passenger trains weighing 900 to 1,000 tons, even upon slopes of 20 millimetres per metre. Goods trains of 2,800 tons are drawn by a single locomotive upon slopes of 10 millimetres (the tractive effort is then 32·8 metric tons), and by two locomotives for steeper slopes. The average weight of goods trains is 1,900 tons. Where two locomotives are employed the second is placed in the centre of the train and not at the rear. It must be remembered that American goods trains, as well as passenger trains, are provided with automatic compressed air brakes on every wagon, and there is thus no danger of their running away.

A considerable advantage of the direct current system is that it does not appear to cause any serious perturbation in telegraph or telephone lines. We were able to satisfy ourselves that the service lines on the railway, running the whole length of the track without any protection, worked satisfactorily. A telegraphic recording apparatus at work between Spokane and Helena upon an earth returning circuit, which was specially set aside for us and applied to a wire running along the posts of the electric railway for a length of 167 miles, has worked perfectly for eight days without being disturbed in the least by three complete short circuits effected intentionally between the contact wire and the rail.

In spite of the loss of energy due to the transformation of the triphase current into continuous current in the rotary sub-stations, which are always working irrespective of load, despite the small number of trains at present working (two passenger trains and three or four goods trains daily in each direction), the efficiency is quite good.

CONCLUSIONS UPON THE CHOICE OF A SYSTEM.

In view of the remarkable results obtained by the Chicago, Milwaukee and St. Paul Railway working on continuous current at 3,000 volts, the writer does not hesitate to decide in favour of the adoption of this system, which he considers to be the only one that is really satisfactory at the present day for electric traction on main lines.

It is possible that the monophase system, which presents at first sight the advantage of a greater number of combinations, may one day arrive at a satisfactory level; but there is no doubt that it is at present far from that state of development.

Continuous current has the disadvantage of being a little more expensive in first charges on account of the rotary sub-stations required to transform the triphase current at 50 periods, which is usually developed by the large power-stations. In order to obtain an advantage on this score by the use of the monophase system it would be necessary to generate this monophase current direct at the small frequency of 16 periods by means of special groups, and if this cannot be done a rotary sub-station would be necessary as before. From this point of view continuous current offers the advantage of being obtainable from any source of energy under the same conditions.

As far as working expenses are concerned very exact and complete figures can alone establish a comparison between the different systems. The author is of opinion, however, that there would be no substantial difference, and it should not have any weight in the choice of a system.

The almost complete absence of disturbances in adjacent telephone and telegraph lines is a very important advantage in the continuous current system over the others.

We have not spoken of the triphase system, which has only a single insignificant example in America; in spite of certain successes obtained by the Italians we are of opinion that it should be rejected in view of its complicated nature and of the high cost of installation and of upkeep of the two contact wires.

ECONOMICAL CONSIDERATIONS AND ELECTRIC TRACTION.

On the economical side, the documents which we have brought back are much less complete than on the technical side. Besides it is necessary to apply various modifications to any figures of this nature before drawing inferences as to European working from results obtained in America. In principle there are two points of great importance—

(1) In America the drawbars have a resistance to breakage of 135 tons and a tractive effort up to 40 tons is possible. In Europe the connections are of two kinds, whose breaking strains are respectively 35 and 55 tons, admitting tractive efforts of only about 10 tons (or 12 to 15 tons in Switzerland).

(2) In America all wagons, whether passenger or goods, are provided with compressed air brakes.

From this it will be seen that the American can employ locomotives having two or three times the power of ours, and goods trains which are two or three times longer and heavier than is possible in Europe, so that the *personnel* required on a goods train is much less numerous and greatly reduces working expenses.

Exact calculations made by the companies, and particularly those for the railways which were first electrified, and the exact price of coal, will be the only way of ascertaining under what conditions electric traction will be more economical than steam traction. It is well known that the economy will be particularly in evidence upon lines with steep gradients and heavy traffic, and it is possible that for some lines to which these qualifications do not apply electric traction may be more costly than steam traction.

In any case the ever increasing importance of economising coal, and the many admitted advantages of electrification, demand the immediate beginning of plans for a progressive electrification of the most important of our systems, viz., the Paris-Orleans, Paris, Lyons and Mediterranean and the Midi Railways.

LONDON TRAMWAY EXTENSION BLOCKED.

VETO OF METROPOLITAN BOROUGHS MAINTAINED.

The London County Council tramway plans received a check in the House of Commons on April 22, when a motion for the suspension of Standing Order 22 was rejected.

Sir A. Shirley Benn, who moved the suspension of the order, explained that the Select Committee by a special report had decided that in the case of the London County Council Bill the principle involved in the Standing Order 22 (which gives the Metropolitan borough councils the right of veto to the making of tramways in their area) was so important that they did not feel justified in exercising their discretion in regard to this suspension without the direction of the House. He pointed out that since 1900 the majority of the inhabitants of the metropolis, acting through their representative on the London County Council, had gone on the principle of owning and working tramways. The twenty-eight Metropolitan boroughs were represented on the County Council, and when that body put forward the Tramway Bill it was for the benefit of London as a whole. He did not ask for the abolition of the Standing Order, but only that it should be suspended while the Bill of this year was before the House. Quick and cheap transport for the workers of London was necessary, and yet when the Bill was put forward it was tied up by the borough councils' vote.

Mr. Gilbert said the most urgent problem in London next to the housing was the question of traffic. London suffered severely from not having a sufficient mileage of tramways. The House ought to grant the County Council the same facilities as were given to tramway authorities in the provinces.

Sir H. Nield opposed the motion. The veto given to local authorities by the Standing Order should, he said, not be relaxed until the Ministry of Transport had set up a London Traffic Board with power to settle all questions of conflict between local bodies and the central authority as to the laying down of tramways.

Mr. E. Gray said the County Council contributed £100,000 a year to local rates, and provided a tramway track which was used by other traffic in preference to the badly maintained sides of the road. The Council had been forced to go outside of the county for housing sites. At Dagenham they were to construct a town for 150,000 people. How were they to be brought to their work if the Council could not get a hearing for its tramway schemes?

Mr. NEAL, Parliamentary Secretary of the Ministry of Transport, said it was not the intention of the Government to interfere with a free vote. The report of the 1918 Traffic Committee had been made the subject of a memorandum by the Minister of Transport to the Cabinet, and it was hoped that they might be able to come to an early decision. After the Bill had become an Act there would be the setting up of the Board and its staff. The Board would require a substantial period to take a view of the whole of the London traffic agencies, tubes, tramways, and omnibuses. Before the Board could come to a conclusion which it could recommend to Parliament, and before the arrangements could be made for promoting and financing a scheme, a number of years might pass by. The hon. member proceeded—It is not simply a matter of the convenience of the population, but it is ultimately a question of the

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housing of the population. The County Council, which is the body set up by Parliament with the responsibility of looking at one aspect of this matter—the tramway aspect—does come to this House and say, on its responsibility, that it is making a proposal to solve this particular problem. The Minister of Transport does not think he ought to advise the House to refuse a second reading to a Bill brought forward on the authority of the statutory tramway authority, but that he ought to endeavour, if he can, to meet the views of the Metropolitan boroughs. This Bill deals with some sixteen major tramway schemes and one or two subsidiary tramway schemes. The Minister would propose, if the standing order were suspended, to make a special report to the Select Committee which will be set up to deal with the matter. He would deal in that report with any of the matters which were put before him by the boroughs, and it would be open to the Committee, which was charged with the inquiry into the Bill, to ask for the advice and assistance of the Ministry upon any part of that Bill. If we were discussing the merits of some of these schemes, they are not schemes which commend themselves, as at present advised, to the Ministry of Transport. The case where it is proposed that a tramway should run into the boundaries of the city, across Ludgate Circus, is not one which would commend itself to the judgment of the Minister. But there are some schemes which seem to him to have within them possibilities of helping to a solution of this difficult and urgent problem. If the House declines to give sanction to the raising of the Standing Orders all the tramway powers of this Bill disappear, the good with the bad. I therefore invite the House not wholly to reject the Bill, but to suspend the Standing Orders.

Sir F. Banbury and Sir W. Davison supported the maintenance of the Standing Order, arguing that no new tramways should be tolerated.

Mr. Bowerman advocated the suspension of the Standing Order, and remarked that when members asserted that tramways were obsolete they were saying that which they could not substantiate.

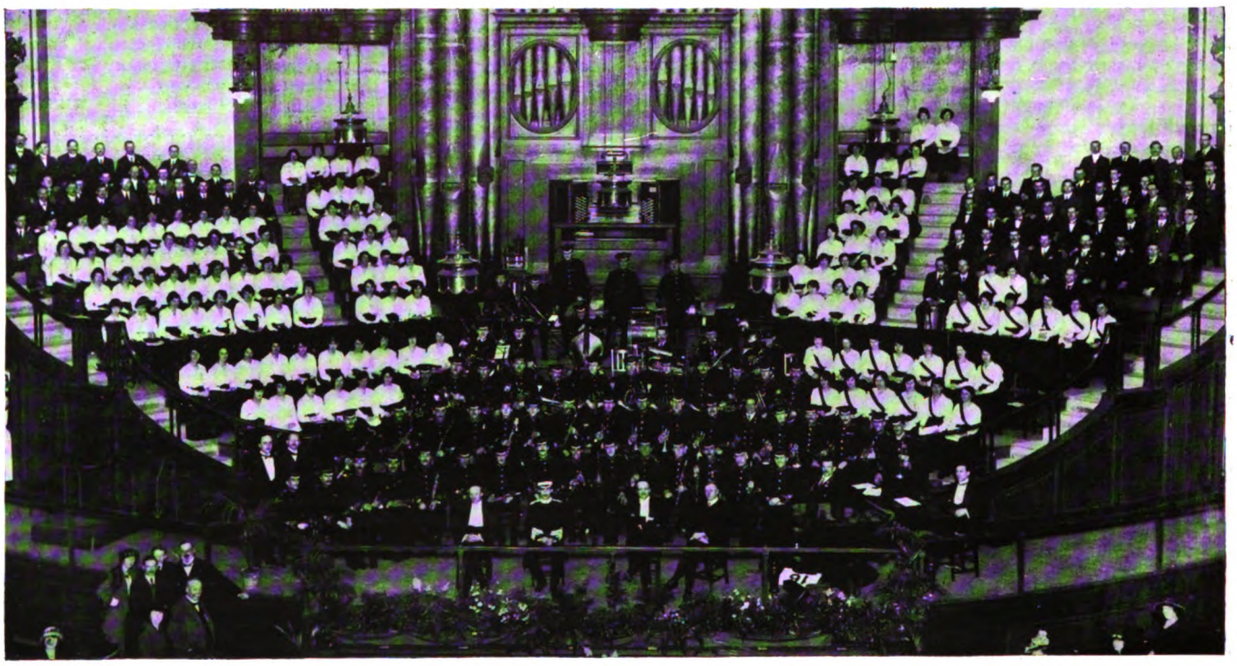
The House declined, by 129 votes to 69, to suspend the Standing Order.

The County Council, at their meeting on May 4, resolved to ask the Government what steps they proposed to take to enable the Council to carry out their duties as the tramways authority for London.

Adaptation of Roads for Omnibuses.—During the consideration of the Wolverhampton Corporation Bill by a Committee of the House of Commons, there was discussion as to the apportionment of the costs of adapting roads for omnibus traffic. Powers were given to run the vehicles in agreement with the local authorities, subject to liability as to adaptation of the roads to be determined by the Minister of Transport. For the Corporation it was contended that the stipulation introduced an unknown factor, which might be such as to make running impracticable from a financial point of view. The discussion ended by the chairman intimating that he understood the Corporation would pay their contribution directly the cost had been ascertained.

"T.O.T." PHILHARMONIC SOCIETY'S CONCERT.

The officials and employees of the London Underground Traffic Group are taking a pride in giving the Metropolis one of its chief musical societies under the appellation of the Tubes, Omnibuses and Tramways Philharmonic Society. Inaugurated in January last, the society gave their first concert in the Central Hall, Westminster, in March, and on April 26 their second concert again served to fill the spacious hall opposite Westminster Abbey with an appreciative audience, over which Lord Knutsford, a director of the Underground Railways, presided. The choir and band consists of over 300 members, drawn from all sections of the Group's army of employees, including both men and women. The society is fortunate in having talented band and choir conductors in Mr. A. Goodfellow and Mr. Ewart Beech respectively. These gentlemen are to be congratulated upon the efficiency to which they have brought their forces. Upon the occasion of the concerts the choir and band, besides performing under the batons of their conductors, are able to unite under the direction of Mr. J. A. Meale, F.R.C.O., one of London's leading organists and conductors. Encouraged by Mr. Meale, the society have pitched their aspirations high, as is shown by the announcement that the next concert is to take place in the Royal Albert Hall on December 7 next, by which time it is hoped to augment the military band with an orchestral section. Another development decided upon is the formation of a dramatic branch. All of these efforts have the active encouragement of



Choir and Orchestra of the Underground Group.

Lord Ashfield, the managing director of the Underground Group, and his colleagues in the various directorates, as well as of the chief officers. The latter were present in force at the concert, their number including Mr. H. E. Blain (operating manager), Mr. J. P. Thomas (assistant operating manager), Mr. F. Pick (commercial manager), Mr. C. J. Spencer (tramways manager), and Mr. J. B. Mackinnon (traffic superintendent of the tramways).

The efforts of the society were supplemented by a number of artistes, including Miss Louise Trenton (the American prima donna), Miss Helen Wilby and Miss Dorothy Pattinson (vocalists), the humorous trio known as the Three Freds, and Mr. J. A. Meale, whose organ solo was a delightful performance. If time had permitted the audience would have encored every item of the programme, which also comprised an organ recital by Mr. A. E. Musgrove, the band selections, Suppe's overture, "Light Cavalry," Chambers' "Reminiscences of the Plantation," and Eilenberg's "Mill in the Forest." The choir were heard in Pinsuti's "A Spring Song," the fantasia "Reminiscences of Verdi," Cuthbert Harriss' part song, "Empire and Motherland," and Pinsuti's part song, "The Parting Kiss." The finale was J. Ord Hume's tone poem, "The Dawn of Peace," by the band, choir, organ and carillon, Mr Meale conducting.

London Omnibus Stopping Places.—The Minister of Transport has stated that the new omnibus stopping places are considered to be satisfactory by the technical sub-committee dealing with them. The sub-committee had in hand proposals for its continuance and for its extension to other routes.

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WAGES NEGOTIATIONS.

National Wage Demand Abandoned—Decisions by Districts. Appeal Tribunals for Employers.

As reported in our issue of April 15, the Joint Industrial Council for the Tramway Industry, having received a recommendation from the South Wales Industrial Council that a further 2s. be added to the basic rates of wages of tramway employees, again met in London for the purpose of considering whether any change could be made in the settlement of the wage question which was arrived at before Easter. It was then agreed that the full demands of the employees for an increase of 10s. per week could not be granted; but an increase of 6s. per week should be made (5s. as from March 29 and 1s. on June 1). Although this arrangement had been agreed to by the representatives of the men on the Council, the decision was received with great dissatisfaction by employees throughout the country, and in several places, including Manchester, Salford, Oldham, Cardiff, and Huddersfield, strikes took place. In the following week there were protracted local negotiations, as a result of which the men returned to work and agreed to abide by the original arrangement pending a meeting of the National Council.

Reason of the Relegation to District Councils.

At this meeting the Council received representations from the affected areas in Lancashire, Yorkshire, and South Wales. They also had before them the decision arrived at by Bradford City Council to concede ten shillings a week to its own employees and to recommend this to the Industrial Council.

After protracted negotiation, it was agreed by both sides of the Council that the agreement reached on March 31 should be adhered to. The next question was the consideration of variations in the basic rates to meet the workers' demand, and representations from certain employers. This aspect of the matter was discussed at great length. In view of the urgent request of the employers, and the view expressed at the meeting that this demand for an alteration in the basic rates was in the nature of a new application which had not been considered before, it was felt that the nine District Councils into which the country is divided should have an opportunity of considering the proposal, and placing their views before the adjourned meeting of the National Council. Ultimately it was agreed that the Council should meet again on April 23.

Meanwhile each District Council was convened by telegram, and asked to meet at once, and the employers and employed on those Councils were able to consider all the points. Their replies were received by the National Council. It had been agreed that whatever ultimate variation, if any, was made in the basic rates should be retrospective from March 29, which is the date from which the increase of five shillings already granted was to take effect.

The last agreement gave an increase only in the war bonus, which was advanced from 34s. to 39s., with a further one shilling in June. That agreement would stand in any event, but in order to reopen the question the Council were now to deal with the tramwaymen's wages from the point of view of the basic rates, which were made up of the earnings received by the men prior to the war. The adjournment had been necessary because none of the employers' representatives had a mandate to agree to the variation demanded.

Terms of Agreement.

At the resumed conference at the Ministry of Labour the Joint Industrial Council, by a majority, reached an agreed decision on the claim for an increase of one penny an hour on the basic rates of tramway workers all over the country, making, with the bonus increase already granted, an advance of ten shillings a week.

It was officially stated that the following resolutions were adopted—

(1) "That the seven District Councils which have been unable to arrive at any definite recommendations be afforded a further opportunity of reconsidering the application referred to them, and be requested to endeavour to arrive at an agreement within a month in regard to the basic rates to be paid by the various undertakings in their areas. In the event of no agreement being arrived at, the District Council shall remit the case to this Council, which may refer the matter for settlement to an arbitrator to be appointed by the appropriate Ministry."

(2) "That the definite recommendations now submitted to this Council by the South Wales and Midland District Councils be ratified."

Mr. J. Beckett, secretary of the Municipal Tramways Association, said it might be taken for granted that any decisions the District Councils might reach in view of the reference to them, would receive the support of the National Council, although under the constitution recommendations must come before the national body for ratification. The decision meant, he said, that it had been left an open question for seven areas to determine themselves what the advances should be.

In the Midland area the settlement was an increase in the basic or pre-war rates of three farthings an hour and a further three shillings a week, making, with the recent bonus increase, eight shillings increase at once and nine shillings on June 1.

South Wales area was on a different footing. By an agreement of both sides of the Council the increase of three shillings a week on the basic rate and eight shillings with the bonus advance included and merged the further shilling a week due under the last agreement on June 1, so that in effect the total increase of the South Wales men was an halfpenny an hour on basic rates.

The districts where local settlements have to be made are—Scotland (except Glasgow); Northern Area (Tyneside, etc.), Lancashire, Cheshire, and North Wales; Yorkshire, Lincolnshire and North Derbyshire; the London metropolitan area; South West and South Coast, and East and South East and part of South Coast.

Although the Industrial Council arrived at an agreed decision, the aim for which the Transport Workers' Federation had been striving—a national settlement on an equal basis for all tramway workers—was not attained, and the Council fell back on the process of local settlements, apparently owing to the special conditions existing in different areas.

Employers Urge the Need for Differentiation.

The claim of the men was considered on May 4 by the Joint Industrial Council for Yorkshire, North Derbyshire, and Lincolnshire, which met at Leeds Corporation tramways office under the chairmanship of Alderman H. Brown (Leeds). Certain recommendations put forward on each side will be laid before the National Council. The point of disagreement was that of differentiation between the undertakings, the employers urging that some differentiation was necessary, whereas the representatives of the Union asked for a flat rate covering all undertakings. In the event of the National Council being unable to reach an agreement, arbitration is proposed.

On May 6 the Northern District Council met at the Town Hall, South Shields, but were unable to arrive at an agreement. It was decided to set up an Appeal Tribunal to meet on May 13, to hear the appeals of those authorities who hold that their financial condition and prospects will not allow them to meet any additional claim. The tribunal would be composed of four representatives of the employers and four of the employees. Mr. Beckett stated that those employers who could do so would pay the three-farthings. The Northern District comprises the Corporations of Newcastle, South Shields, Sunderland, Darlington, West Hartlepool, and Middlesbrough (the latter of which will shortly take over the tramways), and the companies of Gateshead, Carlisle, Jarrow, Stockton-on Tees, and Thornaby, the Sunderland Company and the Tyneside Company.

Tribunals to Adjudicate on Appeals.

The Lancashire, Cheshire, and North Wales District Council of the National Joint Industrial Council for the tramway industry met at the Town Hall, Manchester, on May 3. It was agreed to refer the matter to a special committee of the District Council consisting of representatives of both sides.

Following a meeting of the Midlands Area, Mr. J. Beckett, general secretary of the Municipal Tramways Association and joint secretary for the employers' side of the National Council, announced that the District Council had granted three-farthings an hour on basic rates in satisfaction of the claim for 1d. Manchester and Salford had also granted three-farthings. This arrangement, with the addition of 1s. in June, will give an increase of 9s. per week instead of the 10s. asked for. There would be the right of appeal by authorities who were of opinion that they could not bear any further financial burden to a special tribunal to be set up by the District Council.

Swansea tramways and omnibus employees were still on strike on May 8. They had seceded from the National Industrial Council, and rejected the employers' offer to reopen negotiations provided they resumed work. Further they had resolved not to return until they are granted £5 a week minimum pay, with £2 10s. for those under 18.

INCREASED WAGES REQUIRE INCREASED FARES.

Maidstone.—An increase in fares, amounting to 50 per cent., came into force on May 1.

Gloucester.—Gloucester Corporation propose to apply to the Board of Trade for power to increase their tramway fares.

St. Helens Corporation is applying for authority to increase workmen's fares by 50 per cent. above the present statutory charge.

Rotherham.—The Minister of Transport has consented to issue an order authorising an increase in charges not exceeding 50 per cent. on Rotherham Corporation Tramways.

Aberdeen.—Aberdeen Tramways Committee propose to shorten the 1d. stages, to abolish ½d. fares, to increase the price of composition tickets by 100 per cent., and children's tickets by 50 per cent.

Bristol.—Mr. Samuel White, chairman of the Bristol Tramways and Carriage Company, has announced that the directors propose to take the necessary steps to increase fares by at least 50 per cent. over pre-war rates. Taxi-cab fares are to be increased from 1s 4d. to 2s. per mile.

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DERBY.—Derby Tramways Committee has remitted to a sub-committee for consideration the question of raising all pre-war 1d. fares to 2d., and the introduction of 1d. short stages at busy times of the day.

HASLINGDEN.—The Ministry of Transport have sanctioned the application of Haslingden Town Council for power to increase all tramway fares by 50 per cent., 1d. fares becoming 1½d., and the increase will come into force on April 1.

LIVERPOOL.—Liverpool Tramways Committee are considering the revision of fares owing to increased expenses. They have recommended the Council to authorise a fare of 1d. per mile, or part of a mile, and to abolish the present 1½d. and 2½d. fares.

SALFORD.—Salford Tramways Committee have appointed a sub-committee to consider the question of increasing the fares by one halfpenny on all existing stages. It is estimated that approximately forty million additional halfpennies will be required to meet the increased expenses.

PLYMOUTH.—Plymouth Town Council has declined to accept the recommendation of the Tramways Committee that the Council should apply to the Ministry of Transport for powers to raise fares by 50 per cent. It appears that if the present fares are continued there will be a heavy call on the rates.

CROYDON.—Croydon Corporation, to meet an estimated deficit of £30,000 at the close of the present financial year, has adopted a scheme of shorter fare stages. The new penny stages cover a distance of about three-quarters of a mile. The wages this year will involve an expenditure of about 200 per cent. above the pre-war figure.

HULL.—At a meeting of the Hull Corporation Tramways Committee on April 26, Mr. Digby Willoughby (chairman) presiding, it was decided to increase all 1d. fares to 1½d. as the minimum and to make the fare 2d. for a full journey. This step has become necessary owing to the additional annual expenditure entailed by conceding the tramway men's demands, which aggregate £20,000 a year.

BARROW-IN-FURNESS.—At a meeting of Barrow Town Council on May 3 it was reported that the result of the first quarter's working of the tramways since they were taken over by the Corporation was a deficit of £2,453. Owing to the addition to running costs which have taken place since the estimates were prepared it is anticipated that a further increase in revenue will be required and fares will have to be increased.

STALYBRIDGE.—At a meeting of the Stalybridge, Hyde, Mossley and Dukinfield Tramways and Electricity Board, Alderman Rhodes stated that after the passing of the Temporary Increase of Charges Bill now before Parliament the Board would immediately apply for an order enabling them to increase the longer distance fares. In March last they increased the short distance fares, but at present they had no power to increase other fares.

LEICESTER.—The Corporation have made the following increases in fares—1d. and ½d. fares on all sections and soldiers' and sailors' ½d. fares to be abolished. Children's fares to be increased to 1d. Between the Clock Tower and Stoneygate terminus 2d., the Clock Tower and Clarendon Park Road 1½d., between Horseferry Street and Aylestone terminus 2d. Workmen's return tickets are to remain at 2d. Race car fares are to be increased to 9d.

BRADFORD.—A sub-committee has been appointed by the Tramways Committee to consider the question of tramway fares. The city treasurer has submitted a statement from which it appears that the tramways have been working at a loss during the past three months. Alderman Enoch Priestley (chairman) said that the increase of 10s. per week which had been granted to the men by the City Council meant an increased expenditure of £40,000 per annum.

LEEDS.—Alderman R. A. Smithson (chairman) presided at a meeting of the Leeds Tramways Committee on April 26, when the rejection at the last meeting of the City Council of the committee's recommendation to increase the fares to the statutory limit of 1d. per mile was discussed. In support of the proposed increase the chairman pointed out that the department was losing over £300 a day; but this fact appeared to have no significance to the majority of the members, for by a party vote of six to five they declined to repeat their previous recommendation. For the present, therefore, the fares will remain unaltered, but it is probable that an arrangement will be made between the parties, so that at an early day reconsideration can be given to the matter.

NEWCASTLE.—Councillor R. Mayne, chairman of the Newcastle Corporation Committee, in moving the adoption by the Council of the report of the committee recommending a revised scheme of fares, said that despite an increase in the gross receipts during the past year, the increase in the wages bill consequent upon the decision of the Council to grant to all Corporation employees a 44 hour week and the recent increases in wages, together with the increased cost of coal and other expenses, the receipts were now barely sufficient to meet current expenditure, without making any provision for renewals. Newcastle tramways were almost alone among the larger tramways in the country in not having hitherto raised fares. The committee proposed that the existing fares stages should be immediately raised on the basis of a journey of one mile for 1d., two miles for 1½d., and three miles for 2d., without overlapping fare stages. Councillor Gibbon (Labour) said that as municipalisers they had no objection to the fares being raised in order that the undertaking might be self-supporting, but they objected to any sum being devoted to the relief of rates. The committee's recommendations were adopted, and the new fares came into force on May 1.

GLASGOW.—Glasgow Tramways Committee, on April 22, voted to recommend the addition of a halfpenny to all fares. This will have the effect of abolishing all halfpenny fares and of making the minimum fare a penny. The change will also involve the wiping out of nearly 75 per cent. of the present 1d. stages, the fare for which will be increased to 1½d. For a penny fare passengers will be able to travel roughly 1·5 miles instead of the full two miles as at present. At a meeting of the Town Council on April 29, Ex-Bailie Kelly, convener of the Tramways Committee, moved the recommendation of the Tramways Committee to add a halfpenny to each fare. He proposed to accept, however, the suggestion to give coupons at the rate of 12 for ninepence for the halfpenny stage, which would involve an increase of only 50 per cent. on that distance instead of 100 per cent., which would be represented by adding a halfpenny to the fare. More revenue, he said, must be found. Last May they had for renewals and depreciation £400,000, but if they brought the system up to its pre-war standard they would require £800,000. In May last they had £240,000 in cash; to-day that was reduced to about £70,000. After a long discussion, in which many members took part, the recommendation of the committee adding a halfpenny fare to all fares was carried by 72 votes to 17, with the addendum that twelve tokens could be purchased for the minimum stage for ninepence.

MUNICIPAL ELECTRICAL ASSOCIATION.

PROGRAMME OF ANNUAL CONVENTION.

The preliminary programme of the twenty-fifth annual convention states that the meetings will be held at Bradford and Ilkley from Monday, June 21, to Friday, June 25. The headquarters of the Convention in Bradford will be the Queen's Hall, "The Windsor," Morley Street, and at Ilkley, King's Hall and Winter Gardens.

An informal reception will be held at the Winter Gardens, Ilkley, when members registering will receive badges, tickets, etc. The programme for the following days is summarised below—

On *Tuesday, June 22*, 1920, the Convention will be opened at "The Windsor" (Queen's Hall), Bradford at 10.0 a.m., by the Rt. Hon. the Lord Mayor of Bradford (Alderman W. Wade, J.P.), and Mr. T. Roles, president of the Association and city electrical engineer and manager, Bradford, will deliver his presidential address. Subsequently a paper on "The Design of Distributing Networks" will be read by Mr. C. A. Gillin, mains engineer, Bradford Corporation Electricity Department. After luncheon at "The Windsor," Morley Street, visits will be made to various works. A special train will convey members back to Ilkley at 6 p.m. In the evening there will be a reception at the Winter Gardens by the chairman of the Ilkley Urban District Council, followed by a social evening.

On *Wednesday* the Convention will meet at 10.0 a.m. in the King's Hall, Ilkley, when a paper on "Power Station Design in Relation to Thermal Efficiency" will be read by Mr. I. V. Robinson, of the British Electrical and Allied Manufacturers' Association. In the afternoon visits will be made to places of interest in Ilkley and neighbourhood, and arrangements will be made for a trip by motor chars-a-bancs to Bolton Abbey. The annual dinner will be held in the King's Hall, at which ladies may be present.

On *Thursday* a special train will convey members from Ilkley to Bradford, when the proceedings will be resumed at "The Windsor," (Queen's Hall), at 10.0 a.m., when a paper on "The Standardisation of Tariffs" will be read by Mr. J. W. Beauchamp, director and secretary of the British Electrical Development Association. In the afternoon there will be visits to works, and at 4.30 a reception at the Cartwright Hall, Lister Park, by the Rt. Hon. the Lord Mayor of Bradford. In the evening, at Ilkley, a meeting will be held restricted to "committee" members of the Association, and a meeting of the Associated Municipal Electrical Engineers.

On *Friday, June 25*, the annual meeting of the Association will be held in the King's Hall, and in the afternoon there will be a motor trip to Pateley Bridge and the Nidd Valley (Bradford Waterworks).

As considerable difficulty is being experienced in securing accommodation for members of the Association, delegates and visitors in Ilkley and District, owing to the hotels and hydros being exceptionally full of resident guests, it has proved quite impossible to nominate any one particular hotel as the Convention headquarters of the Association. The members of the council will be accommodated as far as possible in the Wells House Hotel, which may be regarded as the Council's headquarters during the Convention. In order to facilitate the obtaining of accommodation by members, delegates, and visitors, applications for rooms should be addressed T. Roles, Esq., the President, I.M.E.A., Town Hall, Bradford, and marked on the envelope "Hotel Accommodation."

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ENGLISH ELECTRIC COMPANY.

FIRST ANNUAL MEETING.

Sir Charles E. Ellis, G.B.E., K.C.B., presided on April 29 at the first ordinary general meeting of the English Electric Company, held at the Connaught Rooms, Great Queen Street.

The chairman, in moving the adoption of the report, which included a dividend of 8 per cent. on the ordinary shares, said that in the last week the Chancellor of the Exchequer published his proposals regarding taxation for the ensuing year. Strong protests have already reached him concerning the effect of such proposals upon industry, and particularly the continuation of the excess profits tax. It is doubtful whether any alterations in the proposals are either possible or expedient for this year. It is, however, imperative that definite steps should at once be taken to prepare in time for the next Budget some new scheme which will not react so unfavourably upon young and only partially developed industries such as the electrical industry. The balance sheet shows that the share capital of the company at December 31 last stood at just under two millions. Since that date the following additional allotments have been made or arranged for—Preference shares £163,921, and ordinary shares £90,000, which increases the share capital to preference shares £698,564, and ordinary shares £1,521,509, making a total share capital of £2,220,073. These allotments are in exchange for additional shares acquired in certain of our subsidiary companies, in respect of an exchange of shares arranged with J. G. White and Company, Limited, and in part payment of the purchase of the works of Siemens Brothers' Dynamo Works, Limited, at Stafford. We were fortunate in issuing our debentures in August, 1919, on terms which compare very favourably with current rates for borrowing. The sinking fund for these debentures provides for redemption within a period of twenty years. The sum of £100,000 has been placed to capital reserve account.

Amalgamations During the Year.

The most important transactions since the formation of the company are as follow—First, the purchase of the Stafford works of Siemens Brothers' Dynamo Works, Limited, together with the engineering and sales organisation connected therewith. This not only provides an immediate increase of manufacturing capacity, but also provides a working arrangement with Siemens Brothers and Company, Limited, covering the supply on favourable terms of their specialities, notably cables of all sorts, which may be required in connection with comprehensive contracts undertaken by us. Secondly, an amalgamation of the contract department of Dick Kerr and Company with that of J. G. White and Company, in the form of the Consolidated Construction Company, which eliminates one of the strongest competitors of the past. This new company will be useful, and I hope profitable, in carrying out civil engineering work. It should be made clear that J. G. White and Company, with their many ramifications, are unaffected other than in the contract department, and that, while the transaction has been carried out by exchange of shares, there is no binding agreement between the two companies to the exclusion of their respective competitors. In the third place, a subsidiary company, the English Electric Supplies, Limited, has been formed to take over the assets of the Britannia Lamp and Accessories Company, Limited, which formerly marketed incandescent lamps and other accessory electrical apparatus on behalf of Dick Kerr and Company, and arrangements have been made for expanding the variety of this class of manufacture. Finally, a negative transaction is the disposal of the Scotstoun works of the Coventry Ordnance Works, Limited.

Labour and Production—Orders in Hand.

There are indications that the relations between employers and employed are becoming less strained. The recent decision of the National Federation of General Workers to accept payment by results, together with the agreement of the Amalgamated Society of Engineers to subject this question to a ballot, are favourable portents. During last year very little real production took place. We were just getting on to a producing basis when the strike of moulders forced us to immediately reduce output. The effect remains thirteen weeks since the settlement. We are perhaps more fortunate than some in that we have three excellent foundries in our group, but they are handicapped by the shorter hours worked and the fact that piecework arrangements have not been yet agreed to. The importance of this question cannot be over-estimated, as the engineering output of the country is at present limited by its foundry capacity. Our order book is sufficient to keep our 10,000 employees fully employed for eighteen months if only we can get the necessary material; indeed, if material were forthcoming we could double our pay-roll without any risk of running short of work. We have now orders amounting in sale value to £4,750,000, some of which will cover a long period of time to complete, but the bulk is what may be turned quick turnover and repetition work, the demand for which is practically unlimited if only we can secure that production is sufficiently expeditious to compete with America and other foreign makers. Abroad we have not been idle. The manufacturing arrangements made by Dick Kerr and Company with the Constructions Electriques du Rhone in France and the Tokyo Denki in Japan are being taken over by this company, and considerable expansion has taken place, especially in the case of the French company, now known as Constructions Electriques de France, with a subsidiary company known as Les Constructions Electriques de Belgique. In Australia the English Electric Company of Australia, Limited, has been formed with a capital of £600,000, all subscribed locally. This company, like ourselves, is a consolidation of existing manufacturers, and is now erecting new shops especially for production under our various designs.

Electricity (Supply) Act Developments.

The Electricity (Supply) Act, which became law at the end of last year, marks the first step on the road towards the systematic development and organisation of the supply of electric energy. For the first time it may become possible to look at the problem of providing a cheap and efficient supply of electricity as a whole. In the Electricity Commissioners there is created a competent national authority with this express object. The new Act is shorn of some of the features of the scheme contained in the original Bill. It is to be hoped that there will be no immediate revolutionary change in the ownership of the concerns which supply and distribute electricity, even if Parliament should find it advisable to grant the increased powers now asked for. A comprehensive system will come gradually, and there is reason to think that in that way there is a better prospect of its successful introduction. An essential part of the scheme contemplated by the Government is the provision of a number of large generating stations at strategic points, the so-called super-power stations. We are engaged on a comprehensive contract for the construction and equipment at Blackburn of what may be described as the first of the super-power stations. In another sphere, that of electric traction, in the next ten years we shall see important developments. Abroad, as at home, the future is full of promise. Wherever we turn we find in progress or in contemplation the extended application of electric power to industry or to transport. Where, as in India, abundant water power exists, hydro-electric schemes are being developed. In South Africa an important scheme of railway electrification is contemplated. Everywhere electric drive is being introduced into collieries and mineral works, cotton and jute mills, oilfields and sugar plantations. Coming nearer home, the French company with which we are associated, the Constructions Electriques de France, have recently obtained large contracts spread over a term of years for the electrification of the greater part of the system of the Chemins de Fer du Midi. I trust that as the years go by the English Electric Company will maintain a high reputation for excellence of design and good honest workmanship, and so play an honourable part in the development of this great industry.

Mr. W. L. Hichens seconded the motion, which was unanimously adopted.

Sir John A. F. Aspinall, M.Inst.C.E., Lord Meston, K.C.S.I., Messrs. C. T. Cayley, W. L. Hichens, and John Sampson, C.B.E., were re-elected directors.

The directors' report, which was adopted at the meeting reported above, shows that this company has had a very satisfactory first year. The works now controlled and operated by it include the Dick, Kerr works (Preston), Ordnance works (Coventry), Phœnix works (Bradford), Siemens works (Stafford), and Willans works (Rugby), and the products cover all classes of electrical and allied machinery. As the accounts indicate, the company is for the time being a holding one, deriving its profit mainly from dividends on the shares of its subsidiary companies. The directors state that it has always been and still is their intention to consolidate the different constituents into one manufacturing identity, but the process, especially at the present time, is slow. During the greater part of the year several works were occupied in the conversion of the plant from war conditions to those suitable for commercial requirements. The balance to the credit of profit and loss account is £410,835. Deducting debenture interest, £23,942; expenses of debenture issue, £115,659; preliminary expenses, £17,384; transfer to capital reserve account of £100,000; and a dividend of 6 per cent., less tax, on the preference shares to December 31 last, £28,703, there is a balance of £125,144. Out of this balance a dividend is recommended of 8 per cent. per annum, less tax, £79,842, leaving £45,301 to be carried forward. As the English Electric Company owns the whole of the shares of the Coventry Ordnance Works, Limited, and the Phœnix Dynamo Manufacturing Company, Limited, the directors have been able to transfer from these companies sufficient of their undivided profits at January 1, 1919, to permit of the writing off of the whole of the discount on and expenses of the debenture issue, and of the preliminary expenses of the company, besides the setting aside of £100,000 to capital reserve account. Negotiations for the purchase of the Siemens Dynamo Works at Stafford were brought to a satisfactory conclusion at the end of the year, but as possession was obtained only at the beginning of December, no profits have been taken from that source. Since the beginning of 1920 an opportunity has occurred for the disposal of the Scotstoun works belonging to the Coventry Ordnance Company on terms which the directors regard as satisfactory.

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FINANCIAL REPORTS AND MEETINGS.

LONDON COUNTY COUNCIL has recently issued £7,000,000 bonds at £95, bearing interest at 5¾ per cent. The main object is to raise money for housing, at least 5½ millions being required for this purpose. The balance will be required for capital expenditure for tramways, main drainage, and under the new Education Act.

SHANGHAI ELECTRIC CONSTRUCTION COMPANY, LTD.—A dividend of 2 per cent. and a bonus of 6 per cent. (making 16s. per share), less tax, has been declared on the ordinary shares, making 20 per cent. for the year. A sum of £43,000 has been carried to reserve for excess profits duty, £35,000 to general reserve, £10,000 to reserve for renewals, and £3,779 has been carried forward.

INCREASING EXPENSES OF LONDON COUNTY COUNCIL TRAMWAYS.—At the meeting of the London County Council on May 4, the district auditor, reporting on the tramway accounts for 1918-19, said that the Council was faced with a serious position, and that any addition gained by the revision of passenger fares, which resulted in an increase of 21·19 per cent. for the year, had been more than counterbalanced by the increase in working expenses and repairs, which amounted to 34·33 per cent.

BRADFORD CORPORATION TRAMWAY RECEIPTS for the year ended March 31 amounted to £598,565, an increase of £114,102 over the previous year. For the first year in the history of the undertaking the receipts exceeded half a million. The parcel receipts were £16,139, an increase of £4,165. The total wages paid amounted to £343,107, an increase of £105,000. The total number of passengers carried aggregated 86,469,014, an increase of 10,049,555 on the previous year. The energy consumption per car mile averaged 2·412 units, against 2·092 in the previous year.

MAIDSTONE CORPORATION TRAMWAYS.—The report for the year ended March 31, 1920, shows that the revenue amounted to £20,237, and expenditure to £15,761. The profit and loss account showed a gross profit of £4,476, and bank interest £120. Repayment of loans require £1,976, and interest £2,600, leaving a net profit of the year's work of just over £20. Alderman Lyle stated that the committee thought they were very fortunate to come out so well after the heavy demands made upon them during the year. Although their revenue was the greatest on record, their working expenses were also the greatest. The total of wages at £8,684 showed an increase of £3,341 over the previous year.

MANCHESTER CORPORATION TRAMWAYS.—The tramway estimates show an expected deficiency for the current year on the present fares of £353,530. The traffic expenses, which in 1918-19 amounted to £295,541, are estimated at £784,340 for the year ending March 31, 1921. The cost of running the cars, everything included, is 127 per cent. per car-mile above the figures of pre-war days, while the average increase in fares is only 27 per cent. The Tramways Committee have hitherto had to make an annual contribution to the rates of 5 per cent. on the aggregate capital outlay, which amounted to about £100,000. The committee wish to be relieved of this contribution, and a sub-committee has been appointed to interview the Trading Department Sub-committee on the subject.

BRISTOL TRAMWAYS AND CARRIAGE COMPANY, LTD.—The revenue of the Bristol Tramways and Carriage Company, Limited, for the year ended December 31, 1919, amounted to £848,050, as compared with £749,873 for the preceding twelve months. Working and general expenses and renewals amounted to £772,430, or £137,654 more than last year. The net revenue thus amounted to £76,620, or £42,930 less than a year ago. The dividend is maintained at the rate of 7 per cent., tax free, and the carry over of £12,258 is slightly less. A year ago £40,000 was placed to the reserve fund for contingencies and renewals, but only £14,632 was so allocated this year. The report states that the Minister of Transport has declined to accede to the application of the Bristol Corporation for a further extension of the option to purchase the tramways undertaking, which expired in October 31 last. A Bill is being promoted by the Corporation in the present session of Parliament to authorise the construction of a new road along the bank of the Avon between Avonmouth and Hotwells, and includes the construction of a tramroad thereon which would terminate with a junction of the company's tramways at Hotwells. It is stated that for reasons of health Mr. Charles Challenger has been compelled to relinquish his position as manager, but the directors have given him a cordial invitation to join the Board.

SHEFFIELD CORPORATION TRAMWAYS.—At a meeting of the Sheffield Town Council, Sir William Clegg, Chairman of the Tramways Committee, referred to the financial position of the undertaking for the year ended March 26. The revenue for the past twelve months shows an increase of £170,950. Although the number of passengers carried was twelve millions less, the mileage was 800,000 more, which entailed increased working expenses. The wages bill was £142,268 more, and there was only £28,700 left for increased cost of working and the extra mileage. The balance had to be taken from the amount which had previously been allotted to the rates, and the profit was only £218. The estimates had been based on the present figures, but it was impossible to ascertain what would be the expenditure for the coming twelve months. He had allowed for an increased revenue of £165,555, and for the transfer of only £34,000 from the renewals fund. During the past year they had spent £68,000 under that item and they would probably spend as much in the current year. Had there not been an accumulated fund they would have been in a parlous position. They had not reckoned on an increase of 6s. a week in wages, which had been granted since the estimates were made, and this would increase the wages bill by £35,000. They were incurring an expenditure of over £250,000 on new rolling stock and plant, the increased interest and sinking fund on which would be £26,000. The Committee were giving the best estimates they could, and if everything worked out as favourably as they anticipated they hoped to have a balance of £2,226. He did not think any amounts could be applied to the relief of the rates. Tramway undertakings were going through a very difficult time and what the upshot would be he could not say.

PERSONAL.

Mr. J. H. Cowell, tramways manager of Blackburn, has been granted an increase in salary from £600 to £800 per annum.

Mr. W. F. Cooke, chairman of the Electricity and Tramways Committee of Nelson Town Council, has been appointed an Alderman.

Mr. H. Bell, electrical engineer of Kingston-on-Hull Corporation, has been granted an increase in salary from £700 to £1,000 per annum.

Mr. G. Webster, general manager of Rochdale Corporation tramways, has been granted an increase in salary from £600 to £800 per annum.

Mr. B. D. Porritt, M.Sc., F.I.C., F.R.S.E., has been appointed by the Research Association of British Rubber and Tyre Manufacturers as Director of Research.

Sir A. B. W. Kennedy and **Mr. G. W. Partridge** have been appointed consulting engineers to the London Electricity Joint Committee recently formed by a group of London companies.

Mr. F. H. Rudd, electrical engineer, of Rochdale, has been granted an increase in salary from £500 to £700 per annum, with an additional increase of £50 next year and £50 in the following year.

Mr. James J. Ley, head of the stores department of the Bristol Tramways and Carriage Company, Limited, who retires from his duties after twenty-five years' service, has been presented with a silver-mounted umbrella and a case of pipes by the staff.

Sir Robert Horne, President of the Board of Trade, has constituted his private office at the Board as follows—Principal private secretary, Mr. Cecil Litchfield; second private secretary, Mr. C. Patrick Duff; third private secretary, Mr. E. W. Reardon; Parliamentary private secretary (unpaid), Mr. F. C. Thompson, M.P.

Mr. W. M. Wright has relinquished his appointment as secretary of the South Metropolitan Electric Tramways and Lighting Company, and assistant secretary of the London United Tramways, after a service extending over twenty-one years, to take up a position in the provinces. At a concert on April 1, Mr, J. B. Mackinnon, general traffic superintendent of the London United Tramways, on behalf of the staff, presented Mr. Wright with a solid silver tea service.

SHORTAGE OF STEEL PLATES FOR MOTORS.

Mr. E. Manville asked the President of the Board of Trade in the House of Commons recently whether he was aware that the two Scottish steel mills which principally supplied the steel plates required for the manufacture of motor chassis frames are now controlled by a shipbuilding combine which may utilise the products of these mills for the manufacture exclusively of plates required for shipbuilding; that the motor vehicle industry, which even at present is obtaining much smaller quantities of these plates than is required, would be placed in the position of having to close many works with corresponding unemployment; and what steps he proposed to take to prevent such a condition arising

Sir Robert Horne said that his attention had been called to the adverse effect of a shortage of steel plates in the motor industry, and he had been in communication with the National Federation of Iron and Steel Manufacturers on the subject, and had every reason to believe that the importance of an equitable distribution of the output of steel plates was fully recognised by the manufacturers. Mr. Manville inquired whether the question of rationing would be considered, and in reply Sir R. Horne said he should enter very reluctantly upon the question of rations. If he remembered rightly the attitude of all manufacturers in the House had been against any form of Government control.

The Public Utility Companies Bill was read a second time in the House of Lords on Tuesday, April 27. The Bill provides for the variation of the provisions regulating the raising of capital by companies carrying on public utility undertakings for the supply of gas, water, hydraulic power, electricity and tramway undertakings, including light railways constructed wholly or mainly on the public roads.

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TRAMWAY AND LIGHT RAILWAY NOTES.

AYR.

CARRIAGE OF DOGS ON TRAMWAY CARS

Ayr Tramways Committee have compiled a return showing the practice in various towns permitting or prohibiting the carriage of dogs on tramway cars. After considering the report, the committee decided that small dogs should be allowed to travel on the cars at the same charges as for passengers. The town clerk has been instructed to make an application to the Ministry of Transport for the necessary alteration in the bye-laws.

BIRMINGHAM.

IMPROVED LOADING ARRANGEMENTS.

The Birmingham Tramways Committee have accepted various suggestions recommended by the general manager, Mr. A. Baker, for securing improvements in the service. The suggestions deal principally with the rearrangement of the termini. One of the most important changes would be the removal of the High Street terminus to Dale End, between the corner of the Lower Priory and Albert Street. Old Square is suggested as an alternative to the present Steeltone Lane terminus. This will entail the construction of an extra line along a part of Corporation Street to Stafford Street, while a new double line along the extended part of Corporation Street is proposed to save a detour round Aston Street and Gosta Green.

BOLTON.

EMPLOYEES DEMAND EXTRA PAY FOR EXTRA TRAFFIC.

The Bolton branch of the Tramway and Vehicle Workers' Union, anticipating extra traffic on the occasion of the Royal Lancashire Agricultural Show at the end of July, have made a demand for double pay for the four days of the show for all drivers, conductors, and inside staff. Under the present arrangement the men receive time and a half for bank holidays and the last day of the show is the August bank holiday.

BOURNEMOUTH.

SANCTION OF LOAN FOR TRACK RECONSTRUCTION.

Sanction has been given by the Ministry of Transport to the borrowing of £130,000 for the reconstruction and the alteration of the track, and £70,000 for the purchase of 20 new cars. Mr. I. Bulfin, general manager, has reported to the Tramways Committee that the non-delivery of rails was the cause of the delay in the work of track reconstruction. The erection of a tramway shelter at the Moordown terminus, the reopening of the depot there, and the building of a repair shed are under consideration.

BRADFORD.

TRAMWAYMEN'S SOCIAL AND ATHLETIC CLUB.

In a note in our issue of April 15, referring to the new rooms of the Bradford Tramwaymen's Social and Athletic Club, it was inadvertently stated that the men were paying a contribution of one shilling per week towards the maintenance of the rooms. The amount is, of course, one penny per week. Over 1,300 men have already joined the club.

BRIGHTON.

MEN REPLACE WOMEN CONDUCTORS.

Brighton Tramways Committee have decided, in view of the fact that many men having the responsibilities of families are now unemployed, to replace at once all women acting as conductors. Councillor Long said that, while women had given excellent service during the war, it was wrong that 18 months after the armistice they should still be employed on the tramways. He believed it was the duty of the Council to prevent women from doing what was obviously not their work.

BURNLEY.

RESUMPTION OF SUNDAY SERVICE.

The Sunday tramway service was resumed on April 11, after having been stopped for several weeks owing to a shortage of coal at the electricity works. Better supplies are now being obtained.

DARLINGTON.

MEN'S OBJECTION TO SPLIT SHIFTS.

The Electricity and Tramways Committee of Darlington Corporation met specially on April 14 to consider the tramway employees' objection to what they claim to be vexatious working conditions. The men had taken exception to a new time sheet under which their eight-hour day was broken up into shifts, which they asserted would keep them on and off duty for 14 hours a day. The committee heard the deputation and agreed that a day's work should be done at a single stretch of eight hours' duty.

DUBLIN.

TRAMWAY COMPANIES' TENURE.

At the last monthly meeting of Dublin Corporation, a report was submitted on the municipalising of the Dublin tramways. It was stated that the only power of purchase possessed by the local authorities was that conferred by certain Acts, under which purchasing powers will come into effect on December 31, 1938. These empower each local authority in whose district the Dublin United Tramways Company has tramways to purchase them at the time mentioned on the payment of the "then value," exclusive of allowance for profits, compulsory sale or otherwise, with an addition of 30 per cent. If the local authorities wish to anticipate the period fixed for the purchase of the undertaking, they can only do so on obtaining express powers for that purpose from Parliament by the promotion of a Private Bill.

GATESHEAD.

SPAN WIRES SUPERSEDE CENTRE POLES.

The centre poles at Gateshead are being removed, and the trolley wires will be hung from span wires suspended from poles. The centre poles have been found to be a source of danger to vehicular traffic, which has greatly increased since the company electrified its system 19 years ago. The improvement is being carried out by the company's own staff under the direction of Mr. William Morrison, the general manager and engineer, and it is expected that the work will be completed shortly.

LEICESTER.

EXTENSIVE PERMANENT WAY REQUIRED.

Mr. E. George Mawbey, city engineer and surveyor of Leicester, in his report to the Corporation Tramways Committee states that, although every effort has been made to keep the track in good order, it is now evident that extensive renewals will have to be carried out in the near future. Most of the rails where the traffic is heaviest have been in use for 15 years and are very much worn. The maintenance and repair costs during the year ended December 3 last amounted to £15,776. Various new points were fixed and three new crossings, while a number of short lengths of B.S.S. No. 4 rails have been laid. Rail grinding to remove corrugations was carried on continuously from July 14 to October 30. Wherever possible rail joints were made good, and in several cases where joints were beyond repair these were cut out and replaced by a short piece of rail. A number of anchors, both joint and intermediate, were also inserted to remedy looseness and vibration. Three hundred tons of rails with the necessary fishplates were ordered, 40 tons being of the heavy section type for curves. Considerable difficulty was experienced during the year in obtaining materials. A commodious workshop has been arranged for smiths' work, and in these two forges fitted with electrically-driven air blasts have been installed.

LIVERPOOL.

SUCCESS OF THE QUEUE SYSTEM.

The *Liverpool Courier* says that there can be no possible doubt of the success of the queue system recently adopted at the old Haymarket and elsewhere. It is suggested that a shelter should be provided at the bottom of St. John's Lane, as a protection for the great number of passengers who wait there for cars.

LONDON.

CHEAP MID-DAY FARES.

The decision of the London County Council to allow cheap mid-day fares on the tramways south of the Thames from 10 a.m. to 4 p.m. came into effect on Monday, April 19. During these hours a maximum fare of 2d. is to be charged for any distance, but the usual penny stages remain.

MANCHESTER.

RAILWAYS GAIN FROM TRAMWAY STRIKE.—TRAMWAY WIRES SMASHED BY FALLING RAILWAY WAGONS.

Officials of the Lancashire and Yorkshire and other railway companies of Manchester have stated that during and since the recent tramway strike there, more railway season tickets have been issued than ever before. Business men living within six or seven miles of Manchester are apparently finding it cheaper to buy monthly season tickets than to pay tramway fares. A singular accident occurred on April 25 on the Lancashire and Yorkshire Railway at Miles Platting, near Manchester. During shunting operations about 30 goods wagons broke loose and, running down an incline, smashed the stop blocks. Continuing, the wagons damaged a 15 ft. wall and cut in two a coal depot shed. Four of the wagons then mounted one on top of another and fell into a street 20 ft. below. Two electric tramway standards and the overhead wires for some 300 ft. were brought down. Fortunately no tramway car was passing at the time.

PAISLEY.

NEW WAGES AGREEMENT.

The *Paisley Express* mentions as a fine instance of what can be achieved by peaceful methods the results of negotiations that have taken place between the secretary of the Scottish Horse and Motormen's Union and Major F. Coutts, general manager of the Paisley and District Tramways Company. The present agreement as to wages does not expire until July, but in view of the difficulty of workers in meeting the increased cost of living since the agreement was arrived at nine months ago, an increase is to be given at once, with the prospect of a further increase in July. In the course of the negotiations it was pointed out that it was impossible for the company, in view of the high cost of materials, apart from wages, to carry on with the present authorised fares. To mention a few items, pitch has risen during the war from 28s. to £7 5s. a ton, setts have advanced from 24s. to 65s. per ton, while wages have increased by 125 per cent.

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POTTERIES.

TRACK MAINTENANCE.

Mr. W. Thom, general manager of the Potteries Electric Traction Company, has written to the Stafford Town Council in reply to complaints respecting the condition of the track that the maximum amount of repairs and renewals possible has been carried out both during the war and since its termination. The amount of work has been regulated by the materials and labour procurable. The company have consistently looked ahead for supplies, and but for the accumulation now in their hands they would be seriously handicapped by the present inadequacy of materials.

SHEFFIELD.

CONDUCTOR REWARDED FOR A USEFUL SUGGESTION.

At a meeting of the Sheffield Town Council attention was called to an award of two guineas to a conductor for a useful suggestion. Sir William Clegg, chairman of the Tramways Committee, explained that they wished to encourage the employees to take an interest in the undertaking, and those who did so were very likely to rise in the service.

TEES-SIDE.

TRAMWAYS ARBITRATION.

Proceedings in connection with the acquisition of the tramways by the Middlesbrough, Stockton, and Thornaby Corporations will begin about the end of May.

WOLVERHAMPTON.

SURFACE-CONTACT SYSTEM PREVENTS THROUGH-RUNNING.

Alderman Craddock, chairman of the Wolverhampton Tramways Committee, at the last meeting of the Town Council said that the Lorain surface-contact system had now been in service 18 years. The life of the system was only given as about 16 years. The Minister of Transport had intimated that the surface-contact system made intercommunication impracticable. There was no doubt that the Minister of Transport would at an early date examine the conditions at Wolverhampton to ascertain what was preventing intercommunication.

CONTRACTS AND ORDERS.

Salford Tramways Committee have accepted a tender for 500 tons of Sandberg silicon steel girder tramway rails at £13,450.

The English Electric Company's tender for tramcar controllers has been accepted by Manchester Tramways Committee.

The Albion Motor Car Company, Limited, have received a further order from the South African Government for six 50-cwt. chassis.

East Ham Tramways Committee have accepted a tender of the British Thomson-Houston Company for ten equipments for reconstructed tramcars at £817 4s.

Ransomes, Sims and Jefferies, Limited, have received an order from the Dublin United Tramways Company, Limited, for an "Orwell" electric tower wagon.

Frank Mason and Company, Limited, of Maxwell House, Arundel Street, London, W.C., have secured the sole advertising rights on the whole of the London and North Western Railway as from January 1 next.

Southend Corporation Highways Committee recommend the purchase of two British four-wheel-drive tractor lorries from the Bradfield Tractor Company, Limited. The vehicles were originally manufactured for military purposes.

J. W. Courtenay, Limited, of Amberley House, Norfolk Street, London, W.C., who are the advertising contractors for Edinburgh Corporation Tramways, have also been appointed sole advertising contractors for the Corporation's motor omnibuses, which will be used to supplement the tramway service and on certain new routes.

The Peckham Truck and Engineering Company, Limited, of 10, Coleman Street, London, E.C.2, have recently received the following orders for "Pendulum" trucks—Newcastle 23, Plymouth 12, Sheffield 37. They have also received the following orders for the "Thomas" non-automatic brake adjuster—Newcastle 20, Ilford 16, Plymouth 12, Dublin 1, Belfast 1.

New Cars for Middlesbrough.—The Middlesbrough Tramways Committee recommend the purchase of nine double-deck cars from the English Electric Company, Limited. In reply to a question as to whether Stockton Corporation would provide a proportion of the cars, the Mayor, Councillor E. Spence, said that the Middlesbrough cars would be needed for their own use.

Scholey and Company, Limited, contractors to Messrs. C. P. Sandberg, have obtained new orders from the London County Council Tramways and the Bolton Tramways for the treatment by Sandberg's "Insitu" rail hardening process of one mile and two miles of single track respectively. They have also obtained repeat orders from the Liverpool tramways for the treatment of eight miles of single track, and from Manchester for four miles of single track.

The Electro-Mechanical Brake Company, Limited, of Eagle Works, West Bromwich, have recently received the following, among other orders for "EMB" unbreakable and jointless resistances, Maley's patent—Vigo tramways (per the English Electric Company); Midland Railway Company, Bournemouth Corporation Tramways (per the British Thomson-Houston Company), Yorkshire (Woollen District) Tramways (per the British Electric Federation), County Borough of Stockport, Oldham Corporation Tramways, Sheffield Corporation Tramways, Dunfermline and District Tramways, Manchester Corporation Tramways, and Dover Corporation Tramways.

BUSINESS NOTICES.

TRAMWAY SUPPLIES, LIMITED.—The address of this company is now Grove Mills, Meanwood, Leeds, and their telephone number 68 Headingley.

C. A. VANDERVELL AND COMPANY, LIMITED, of Acton, the well-known electrical engineers, have been granted the warrant of appointment as manufacturers of electrical equipment for motor cars to His Majesty, with authority to use the Royal Arms. The warrant, as is customary, is issued from the office of the Master of the Horse.

MR. W. H. LANE, of W. H. Lane Proprietary, Limited, electrical and mechanical engineers, Equitable Buildings, Sydney and Melbourne, is at present in London. To firms requiring a representative for prime movers such as steam turbine sets, high-speed engines, electric motors and generators, Mr. Lane would be pleased to give full information. Letters to him should be addressed care of the Agent-General for N.S.W., London.

THE ENGINEERING AND LIGHTING EQUIPMENT COMPANY, LIMITED, announces that it has taken over the works of the Engineering and Arc Lamps, Limited, at St. Albans, Herts., having purchased the business, stocks, patents, trade marks, etc. The entire staff is being retained, and the new company will carry on the same business as formerly, but it proposes to manufacture some additional articles.

MESSRS. JOHN E. RAWORTH & MOSS, have been compelled to vacate their offices owing to Queen Anne's Chambers being acquired by the Government for the Ministry of Labour, and have removed to 75, Victoria Street, Westminster, London, S.W.1. Their telephone number and telegraphic address remain as before.

MESSRS. JOHN YATES & COMPANY, LIMITED, of Ashton Manor, Birmingham, included a number of tramway tools and appliances in their exhibit at the recent Building Exhibition at Olympia. Among them were the firm's well-designed rail carrier fitted with plate wheels together with rail jacks, jim crows, rail tongs, spanners and levers, etc. They also had a comprehensive collection of contractors' plant and tools suitable for various types of road construction. Mr. T. J. Sedgley, who has recently been appointed manager of the contract department, was personally in charge of the exhibit.

MILLAR'S TIMBER & TRADING COMPANY, LIMITED, of Pinners' Hall, London, E.C., hope shortly to be in a position again to supply a limited number of Karri and Jarrah wood paving blocks. These Australian hard woods have been unobtainable during the war, but so great was the reputation which their hard-wearing qualities established in pre-war days that a constant demand has been made for them. It will, therefore, be good news to those responsible for the upkeep of our roadways that a supply is now on the way to this country. A notable extension of Millar's business in connection with road making is the marketing in this country of the "Jaeger" concrete mixer. It is claimed that these machines are the most perfect of their kind, and that as labour-saving devices they are unequalled. Although only recently introduced Messrs. Millars have already supplied them to the Manchester Corporation, Bermondsey Borough Council, Uttoxeter U.D.C., and a number of other corporations. Mr. Walter Green is in charge of this department and will be pleased to hear from his old friends.

SPANISH ELECTRIC RAILWAY CONCESSION.—The "Gaceta de Madrid" of March 14 contains a notice stating that tenders will be opened at the Department of Public Works of the Ministry of Development on May 18 for a concession of sixty years for the construction and working of an electric tramway from Coruna to Sada. Work on construction must be commenced within three months from the date of the granting of the concession, and be completed within three years. An option on the concession is held by the Compania de Traccion de la Coruna.

ELECTRICITY SUPPLY BILL.—The Electricity Supply Bill was read a first time in the House of Commons on April 13. It includes the compulsory powers for the purchase of undertakings and other provisions that were cut out of the measure passed in the last session. The opposition in the House of Lords was so strong that the Government then withdrew the clauses, and the hostility has not abated in the meantime. Whether the Government will now succeed remains to be seen.

ELECTRIFICATION OF THE PAULISTA RAILWAY.—The General Electric Company of America is to carry out forthwith the electrification of the Paulista Railway. The double track between Junihay and Campainhas will be electrified, overhead conductors being used, and a power-station will be erected at Louviers. The work will form one of the largest railway electrification schemes yet carried out.

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PATENT LIST

Abstracted for "The Tramway and Railway World" from the Official Journal of Patents.

***** If the inventions have been communicated the names of the communicators are given in italics.**

APPLICATIONS FOR LETTERS PATENT.

The number of the patent is given in brackets.

Pulleys for trolley poles of tramcars (9,303)—G. A. Bishop and R. A. Chadwick.
Signalling devices for road vehicles (9,456)—H. E. Bradley.
Fluid brake for motor vehicles (9,459)—F. G. Hultenheim.
Driving mechanism for motor vehicles (9,232)—W. Mason.
Propulsion of electrically-propelled vehicles (9,438)—A. Raworth.
Direction indicator for vehicles (9,327)—S. S. Smith.
Steering gear of motor vehicles (9,360)—A. E. Stock.
Steering gear for motor vehicles (9,244)—F. W. Tyler.
Changing destination and route indicator for tramcars, etc. (9,191)—F. Walmsley.
Internal combustion engines and mechanism of motor vehicles (10,018)—A. E. Alexander (*Metal and Thermit Corporation*).
Indicating device for motor vehicles (9,877)—W. J. Archer.
Indicators for tramcars, etc (9,858)—H. B. Cadman.
Variable gear for motor vehicles (9,727)—J. Gardiner and A. Hunter.
Anti-skid devices (9,930)—A. T. Sheldon and H. W. White.
Dynamo electric systems for automobiles (9,680)—E. O. Turner.
Motor vehicles (9,982)—A. G. Grice.
Gear boxes for motor vehicles (10,502)—Albion Motor Car Company and T. B. Murray.
Change gear mechanism for motor vehicles (10,696)—F. Barraclough.
Fuel feed apparatus for motor vehicles (10,504 and 10,505)—C. Binks and W. H. Porter.
Roadway junction crossings (10,533)—W. S. Boult.
Self-propelled vehicles (10,406)—R. Burn.
Compressed air control mechanism for brake cylinders of tramway cars (10,606)—A. T. Harrop.
Covers for passengers and seats on omnibuses (10,396)—W. C. Larcombe and E. E. Rendle.
Collapsible cover for outside seats (10,522)—J. W. Middleton.
Tires for motor vehicles (10,556)—R. Parkinson.
Rail joints (10,369)—A. Robinson.
Rail joints or fishplates (10,141)—L. M. Smith.
Collapsible omnibus and tramway cover (10,538)—A. and S. Warren.
Overhead electrical conductors, cables, etc. (10,566)—A. Watts.
Fluid pressure braking apparatus (10,164)—Westinghouse Brake Company.
Shock absorber for vehicles (11,346)—G. Antonelli.
Lifting jack for motor vehicles (11,315)—H. Baron.
Foot-brake lock for motor vehicles (11,420)—W. G. Beesley.
Lifting jacks (10,814)—A. E. Berriman and Daimler Company.
Electric signalling devices (11,183)—British Thomson-Houston Company and A. P. Young.
Brake shoe (11,252)—B. S. Fountain.
Aprons for tramcars (11,022)—General Seating Company and W. J. Hickman.
Motor vehicles (11,172)—E. C. Goodfellow.
Combined fuel and oil tanks for motor vehicles (10,790)—Graiseley Motor Accessories, Limited, and J. W. Roberts.
Lifting jacks (11,439)—Iron City Products Company.
Direction indicators for vehicles (10,985)—A. Latshaw.
Reversible seat apron for tramcar, etc. (10,813)—E. E. Rendle.
Means for joining rails (11,067)—S. Sokal (*M. Alvares*).
Elevated railways and rolling stock for use thereon (10,868)—F. M. Weymouth.

SPECIFICATIONS PUBLISHED.

1916.

Stopping place indicators for tramcars (14,677—*140,475*)—E. Roscoe.
Regulating mechanism for controlling speed of induction motors (16,250—*140,476*)—British Thomson-Houston Company (*General Electric Company*).

1918.

Air brake systems (19,052—*140,493*)—British Thomson-Houston Company (*General Electric Company*).

1919.

Clutches for motor vehicles (297—*139,546*)—W. N. Baker.
Automobile air brakes (908—*139,553*)—C. T. Alexander.
Combined variable friction transmission gear and engine unit for motor vehicles (4,335—*139,590*)—T. S. Smith.
Tramway rails and chairs (6,023—*139,619*)—J. Crimmins.
Fluid pressure braking apparatus (7,312—*139,636*)—Westinghouse Brake Company (*Westinghouse Air Brake Company*).
Electric motor control systems (8,083—*139,647*)—British Thomson-Houston Company and A. A. Pollock.
Trolley heads of electric tramcars (6,025—*139,890*)—R. J. Clarke.
Driving devices of motor vehicles (8,538—*139,911*)—O. Imray (*M. Walter*).
Epicyclic change speed gear (14,407—*139,970*)—P. G. Guilford.
Gear boxes for motor vehicles (3,032—*140,164*)—J. C. Moore.
Control valves for fluid pressure braking apparatus (7,603—*140,596*) Westinghouse Brake Company and L. G. Stone.

1920.

Lubricating apparatus of motor car engines (626—*140,734*)—J. Fielding.

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TRAFFIC RETURNS.

Tramway and Omnibus Undertakings in the United Kingdom.

NAME OF COMPANY OR CORPORATION.	1919. WEEKS ENDED					1920. WEEKS ENDED.					AGGREGATE.		
	April 4	April 11	April 18	April 25		April 3	April 10	April 17	April 24		Wks.	1920.	Increase or Decrease.
	£	£	£	£	£	£	£	£	£	£		£	£
Aberdare U.D. Council	425	580	531	769	...	737	679	641	637	...	3	1,957	+ 77
Aberdeen Corporation	2,567	2,868	2,892	3,091	...	2,952	3,181	3,315	3,196	...	46½	150,182	+ 27,662
Ayr Corporation	530	478	544	754	...	519	721	530	533	...	49	32,997	+ 4,789
Barrow Corporation	...	682	816	961	...	...	888	723	734	...	3	2,346	− 114
Belfast City Tramways	8,740	9,598	9,785	11,658	...	11,001	12,073	10,927	11,174	...	4	45,175	+ 5,394
Birkenhead Corporation	2,392	2,353	2,398	2,530	...	3,078	3,227	3,151	3,221	...	3½	11,316	+ 2,056
Birmingham Corporation	24,913	25,600	25,381	28,355	...	25,996	28,028	26,943	27,420	...	4	94,156	− 4,290
Birmingham Motor 'Buses	1,455	1,515	1,532	2,065	...	1,738	2,034	1,780	1,873	...	4	6,471	− 213
Blackburn Corporation	1,657	2,086	1,988	3,873	...	1,833	3,229	2,099	2,372	...	3½	9,534	+ 217
Bradford Corporation	7,314	10,203	11,395	13,612	...	11,669	13,612	12,139	12,013	...	4	43,485	+ 534
Burnley Corporation	2,781	3,003	3,681	3,529	...	3,379	3,386	3,377	3,269	...	—	—	—
Burton-on-Trent Corporation ...	401	404	499	502	...	563	582	580	562	...	4	2,060	+ 424
Bury Corporation	2,121	2,176	3,052	2,749	...	2,795	2,419	2,515	2,403	...	3½	9,220	− 603
Chatham and District	1,308	1,418	1,499	1,794	...	1,546	1,695	1,624	1,602	...	16	23,788	+ 3,054
Cork Electric	559	619	632	711	...	828	853	595	822	...	16	12,475	+ 3,479
Derby Corporation	1,528	1,519	1,710	1,799	...	2,166	2,299	2,113	2,093	...	4	7,679	+ 1,361
Dundee City	2,051	2,184	2,202	2,380	...	2,478	2,610	2,449	2,595	...	48½	123,823	+ 26,947
East Ham Corporation	1,683	1,808	1,835	2,145	...	1,767	1,846	1,651	1,790	...	3½	6,110	− 370
Edinburgh Corporation	9,118	9,720	10,722	11,615	...	11,096	11,842	11,026	11,939	...	42½	470,189	+ 86,437
Glasgow Corporation...	30,419	31,211	30,938	33,354	...	33,281	33,268	33,656	34,272	...	47½	1,534,634	+ 185,060
Glossop (Urban Elec. Supply Co.)...	215	225	264	259	...	254	250	235	234	...	17	3,904	+ 178
Huddersfield Corporation	3,911	4,345	4,633	6,392	...	4,041	...	3,532	4,590	...	4	12,164	− 7,118
Ilford U.D. Council	1,072	1,123	1,225	1,254	...	1,227	1,334	1,159	1,188	...	3½	4,273	+ 67
Ipswich Corporation	692	750	902	897	...	983	1,022	892	863	...	4	3,283	+ 433
Isle of Thanet	404	590	555	1,415	...	686	1,584	916	790	...	29½	17,511	+ 6,647
Kilmarnock Corporation	364	288	286	320	...	318	342	325	330	...	49½	14,686	+ 1,384
Lanarkshire	3,595	3,871	112	861	...	4,013	4,280	4,027	4,409	...	16	64,233	+ 11,227
Leeds City	14,915	15,334	16,212	...	...	16,275	18,407	15,792	...	...	3	41,990	+ 4,942
Leicester Corporation	5,208	5,848	5,777	6,365	...	6,339	7,064	6,457	6,758	...	—	—	—
Leyton U.D. Council...	2,609	2,807	2,903	3,724	...	3,060	3,494	2,937	3,006	...	4	12,497	+ 454
Liverpool Corporation	21,354	22,332	22,524	24,189	...	25,602	26,905	26,244	27,214	...	16½	425,349	+ 85,186
London County Council	70,904	74,937	75,099	82,664	...	80,845	79,898	79,528	81,337	...	3	240,803	+ 8,133
Maidstone Corporation	634	320	321	405	...	399	721	393	371	...	3½	1,556	+ 115
Manchester Corporation	28,066	...	31,138	33,339	...	30,901	...	17,626	29,944	...	4	61,959	− 44,340
Newcastle-on-Tyne Corporation ...	3,564	8,938	9,332	9,593	...	4,394	11,221	9,080	9,368	...	3	34,048	+ 2,482
Northampton Corporation	...	...	...	...	...	...	...	...	...	...	—	—	—
Nottingham Corporation	3,989	9,532	7,231	7,983	...	6,807	9,195	7,201	7,541	...	3	23,938	− 809
Oldham Corporation	3,894	4,022	4,908	4,839	...	4,484	436	4,504	4,487	...	5	16,776	− 3,976
Reading Corporation...	768	1,515	1,551	1,633	...	1,531	1,897	1,865	1,765	...	3	5,858	+ 943
Rotherham Corporation	...	2,142	2,165	2,863	...	...	2,533	2,499	2,534	...	3	7,568	+ 397
St. Helens Corporation		...	...	...	...	1,727	2,125	1,663	1,756	...	3	5,546	—
Sheffield Corporation	16,726	16,704	19,916	18,231	...	19,541	21,205	17,215	20,151	...	4½	89,599	+ 13,911
Southampton Corporation	...	2,578	2,532	3,181	...	...	3,509	2,706	1,437	...	3	7,653	− 1,399
Southampton Motor 'Buses ...	...	...	...	...	...	...	255	229	317	...	3	802	—
Southend Corporation	869	1,741	1,404	2,690	...	1,597	2,651	1,743	1,669	...	3	6,063	+ 228
South Shields Corporation	1,248	1,342	1,479	1,602	...	1,542	1,554	1,783	1,778	...	4	5,882	+ 949
Sunderland Corporation	2,498	2,731	2,974	3,080	...	1,594	3,029	2,879	2,860	...	4	10,365	− 918
Swindon Corporation	272	286	295	439	...	361	413	356	356	...	3	1,125	+ 105
Tyneside Tramways and Tramroads	884	984	964	1,618	...	1,016	2,178	917	1,050	...	16	17,219	+ 2,692
Wallasey Corporation	2,110	2,247	2,477	2,957	...	2,344	2,675	2,347	2,404	...	3½	8,510	− 789
Walsall Corporation	977	1,337	1,405	1,800	...	796	2,018	1,593	1,662	...	4	6,069	+ 550
Walthamstow U.D. Council ...	1,598	1,646	1,886	2,025	...	3,286	2,154	1,799	1,898	...	3½	6,932	+ 760
Warrington Corporation	890	874	931	1,024	...	1,044	981	959	976	...	3	2,916	+ 87
West Ham Corporation	4,884	5,193	5,333	6,270	...	5,529	5,668	5,171	5,200	...	3½	16,817	− 1,984
Wolverhampton Corporation ...	1,207	1,846	1,823	2,471	...	2,326	2,722	2,239	2,327	...	3	7,288	+ 1,148

Colonial and Foreign Tramway Traffic Returns.

NAME OF COMPANY.	1919. WEEKS ENDED.					1920. WEEKS ENDED					AGGREGATE.		
	April 4	April 11	April 18	April 25		April 3	April 10	April 17	April 24		Wks.	1920.	Increase or Decrease.
	£	£	£	£	£	£	£	£	£	£		£	£
Anglo-Argentine	61,541	66,988	60,190	55,406	...	73,232	70,496	81,304	80,571	...	16	1,175,724	+ 257,140
Calcutta ... ... Rs.	84,546	83,429	75,794	77,030	...	85,192	88,774	92,740	94,660	...	16½	1,487,467	+ 101,357
Madras ... ... Rs.	...	...	...	...	...	...	...	...	...	...	—	—	—
Pernambuco	5,811	5,436	5,448	5,385	...	7,436	7,039	7,095	6,823	...	16½	129,870	+ 40,068

Companies issuing Monthly Statements only.

	1918.		1919.				1919.		1920.				Wks	AGGREGATE.	
	Nov.	Dec.	Jan.	Feb.	Mar.	April	Nov.	Dec.	Jan.	Feb.	Mar.	April		1919-20.	+ or −.
	£	£	£	£	£	£	£	£	£	£	£	£		£	£
Ballarat & Bendigo	3,884	4,504	3,603	3,052	...	...	4,219	5,119	4,250	4,279	...	...	48	45,673	+ 3,538
Brazilian Trac. Mlns	7581000	8531000	8522000	7972000	...	...	9796000	9739000	9655000	9381000	...	...	8	19036000	+ 2542000
Brisbane	...	...	38,575	34,380	39,380	...	...	...	44,800	41,600	45,460	...	13	131,860	+ 19,525
British Columbia $	612,893	691,065	677,489	645,415	...	...	733,981	783,324	828,709	746,030	...	...	34	5,796,655	+ 1,055,656
Buenos Ayres L'c'z.	42,952	50,460	41,556	42,429	470,370	...	50,635	55,873	52,642	52,468	55,000	...	39	453,687	+ 63,108
Burma	34,408	34,593	38,265	35,926	38,440	...	46,755	43,571	41,749	41,814	45,117	...	34	357,739	+ 68,568
Cape Town ...	...	...	...	...	...	...	...	...	26,009	20,623	25,089	...	—	—	—
Carthagena & H. ...	2,988	2,950	3,655	2,351	2,400	1,786	2,549	2,923	4,748	4,008	3,493	5,482	17	17,731	+ 7,539
East India ...	1,942	2,048	1,970	1,689	2,016	...	2,709	2,916	2,988	3,001	3,592	...	35	23,653	+ 8,025
Kalgoorlie	2,933	2,848	2,562	...	...	...	2,859	2,560	2,573	...	...	...	4	2,573	+ 11
La Plata	5,334	5,792	5,730	6,698	6,592	...	6,240	6,324	3,155	6,894	6,392	...	13	16,441	− 2,579
Lima	44,910	...	...	...	...	...	52,086	...	...	...	...	...	48	531,788	+ 51,653
Manila ... $	214,292	236,612	231,586	211,676	...	...	247,599	276,000	278,338	278,243	...	...	8	556,581	+ 113,319
Monte Video	...	...	40,910	...	...	...	...	...	47,767	...	...	...	13	132,450	+ 21,401
Para	19,765	23,800	24,515	23,248	26,022	...	25,422	24,412	24,306	24,303	24,883	...	17	97,904	+ 319
Peruvian ... $	...	1057990	...	...	...	...	...	1310880	...	...	...	...	—	—	—
Port Elizabeth ...	...	...	...	...	...	...	...	...	7,827	6,166	7,214	...	—	—	—
Rangoon	6,611	6,188	6,373	5,694	7,533	...	7,379	5,717	7,467	7,667	8,698	...	13	23,832	+ 3,787
Toronto ... $	1071106	...	1106840	1015797	...	...	1111177	...	1130486	1113717	...	...	8	2,244,203	+ 121,569
Winnipeg ... $	260,601	...	390,539	371,162	...	...	423,826	...	498,837	444,873	...	...	8	943,710	+ 182,009

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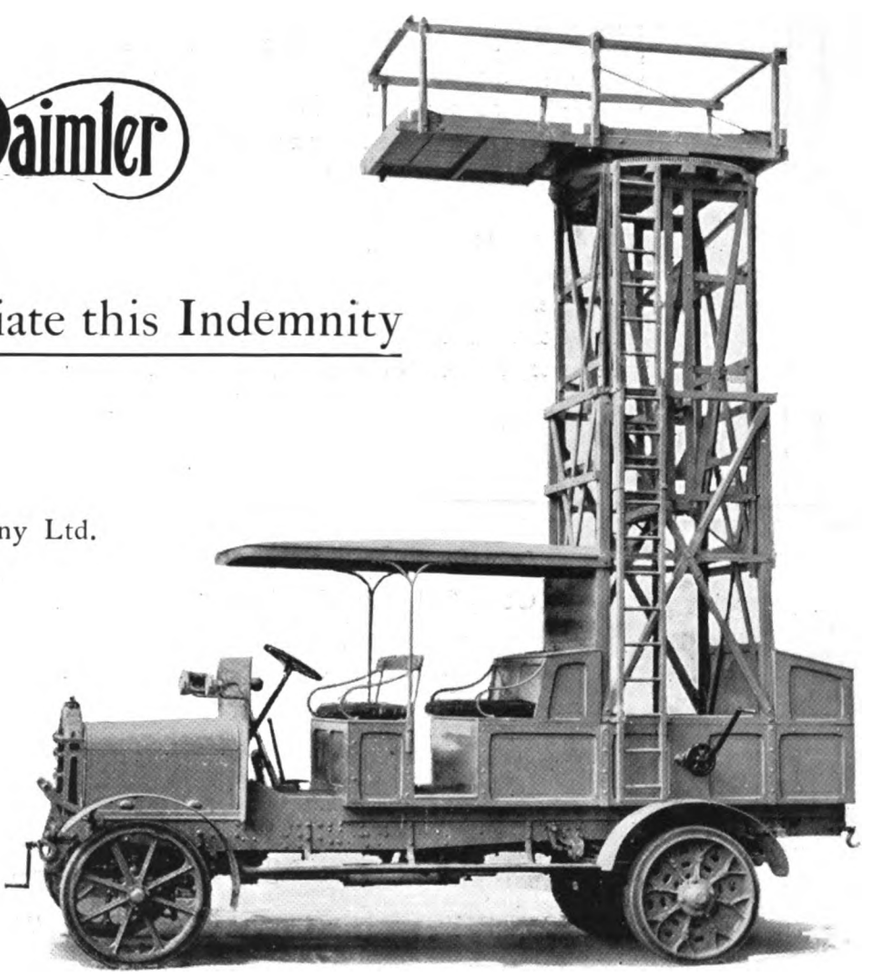

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"WE should like to express our great satisfaction with the behaviour of this machine, as, notwithstanding the fact that it has been running hard and continuously since last April almost every day, *it has never cost a farthing for repairs of any description*, and it is to-day mechanically perfect. as you can see for yourselves by testing it. As you are aware, this machine was engaged on passenger work daily, including Sundays, all through the summer, and during the recent Railway Strike had several very long journeys loaded to its fullest capacity, so that we consider that it has been severely tested, and has proved satisfactory in every way; in fact, it is a 'no trouble machine.'"

Extract of letter received from Messrs. J. R. Bateman & Son, Sutton Bridge. 4th December, 1919.

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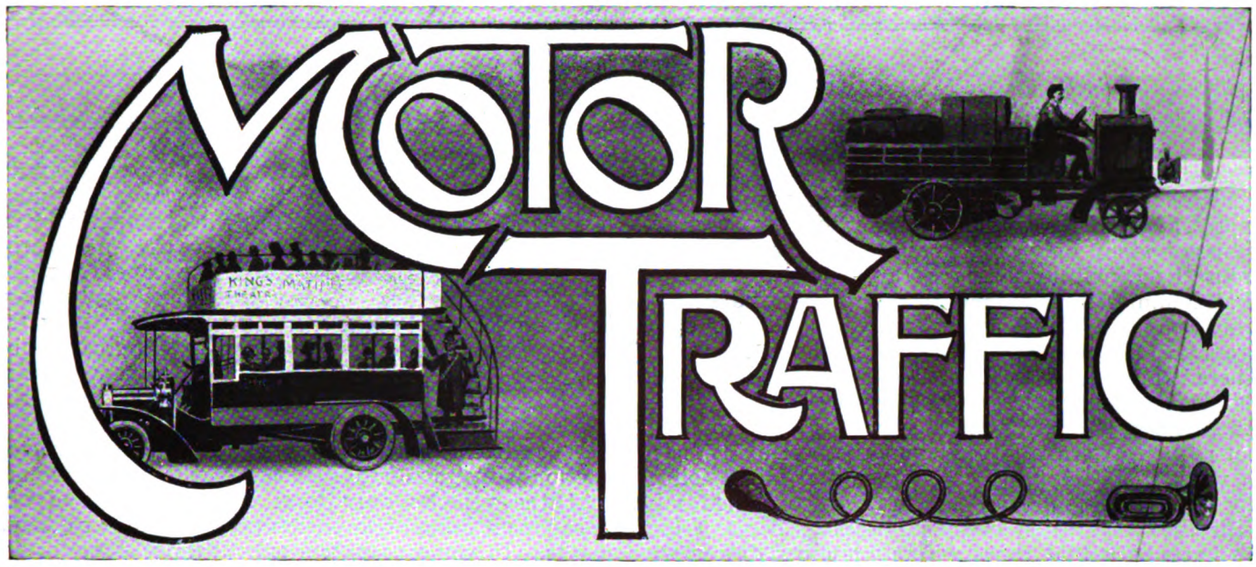

FUEL PROSPECTS.

At the C.M.U.A. luncheon Sir Marcus Samuel clearly hinted at the possibility of an early return to some scheme for rationing petrol. We assume that if this becomes necessary as a temporary expedient every effort will be made to ensure that it is the joy rider and not the business man who suffers. One of the main difficulties is, of course, that some private vehicles are used for purposes far more essential and useful to the community than some commercial and public service vehicles. Thus it is very difficult to evolve a scheme that can be at all fair in the great majority of cases. While deploring a rationing of petrol, such an event might conceivably be all to the public good in the long run. Things with which motor owners put up during the war will not be taken so easily two years after the war is over. Such conclusive evidence of the shortage of an essential commodity would compel the Government, even at a time when everyone is preaching economy, to provide both money and brains to accelerate the production of alternative motor fuels. Even now the increases in the price of petrol have led to such general nervousness that those who for many years have preached the necessity of developing power alcohol supplies at last see some prospect of useful action being taken. Meanwhile it would seem that the attitude of the established distilling interests towards the proposition has changed. They are no longer hostile to the idea of producing fuel alcohol to be marketed at the lowest possible price consistent with a reasonable profit. It seems that if the agricultural communities in the various suitable parts of the Empire can get together sufficiently to ensure the growth of alcohol crops in adequate quantities, the distillers will be willing to co-operate by establishing local distilleries, arranging for the transport of the surplus fuel to the coast, and looking after its subsequent distribution. The arrangement proposed would involve a payment sufficient to give a certain profit to the growers of the crops, and an engagement under which the growers would also share in any subsequent profit resulting from the sale of the fuel. It is known that a big scheme is in preparation for the production of industrial alcohol on a large scale from crops and waste vegetable matter in India. The whole fuel position has become so acute that it is no longer conceivable that such developments will be crippled by reason of stupid conservatism in respect of excise regulations. Altogether it seems possible that the alcohol fuel age, which certainly cannot be postponed for more than a few years, may be allowed to commence in the near future.

THE NEW TAXATION.

The new scheme of motor taxation is accepted by the motoring community not as being in itself desirable, but as being probably something approaching the best that can be devised if one is compelled to assume that the only fair systems are not feasible. The Government having stated that the continuance of the petrol duty was impossible, and that an alternative must be found, owners are in the unfortunate position of having to put up with a system under which the amount of tax paid bears no definite relation to the use which the individual vehicle makes of the road. In the new scheme every class of vehicle is taxed upon a different basis. The least objectionable is certainly the basis of unladen weight which is applied to commercial vehicles. Next comes the basis of seating capacity applied to public service vehicles. The taxation of private motor vehicles on a basis of horse-power is extremely unsatisfactory. It is likely to lead to a great deal too much attention being paid to an arbitrary horse-power formula. It is very unfair to the owners of comparatively old cars of low value but possessing engines of large dimensions. It is also very unfair to the man who can only use his car occasionally, and who therefore pays part of the tax for the man of leisure who uses a car every day throughout the year. It is objectionable as discouraging the principle of owning two cars, one substantial and the other light, and using on any occasion the one best fitted for the work to be done. It is bad as likely to lead designers to cut down power to a minimum and to go to extremes in the way of attempting to produce engines giving abnormal power for their dimensions, and thereby rendered liable to give very inferior results unless handled by an expert. From the official point of view this whole matter of motor taxation has been cleverly handled. Representatives of the industry and of the motoring community have been invited to give their counsel, but developments have been so shaped that the resultant report was probably just what the Government wanted, while causing widespread dissatisfaction among vehicle owners.

TAXATION OF HORSED VEHICLES.

Perhaps the most astonishing thing about this report of the Departmental Committee on Taxation and Regulation of Road Vehicles is that it includes a definite recommendation that there should be no

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MOTOR TRAFFIC

change in the duties payable in respect of horsed vehicles. Amongst those who signed the report were representatives of several important motoring organisations, of whom only one definitely dissociated himself from the conclusions reached. One can understand that the Committee realised that political considerations would prevent the Government from acting on any proposal for the increased taxation of horsed vehicles. There is no reason, however, why the Committee itself should be similarly influenced by such considerations. An Advisory Committee of this kind is in our opinion not required to take into account the possible transfer of votes from one party to another that might follow upon the adoption of its report. It is concerned only with the preparation of an equitable scheme. Now we have been told times without number during the last few months that motor taxation must be increased because the cost of road construction and maintenance has risen. There was no reason, the public were given to understand, why each individual vehicle in the future should not pay for the work requiring to be done on the same number of square rods of road as was maintained by its contribution in the past. This meant that the contribution had to be increased. It is obvious that in common fairness the same principle should be applied to horsed traffic, and one is left with the impression that on this point more obviously than on many others the bulk of the Committee has allowed itself to be led by the nose by the official element. In this connection it must be noted, however, that the representative of the Treasury on the Committee signed the report subject to a comment that *all* forms of road transport should make substantial contributions. The representative of the Automobile Association, who did *not* sign the majority report, maintains in his minority report that *all* classes of vehicular traffic should contribute their proper quota. In connection with this report we would also deprecate the principle involved in prefacing it by what is apparently intended to be a brief digest of its contents. We cannot imagine that this digest, apparently intended for Press consumption, was submitted to the Committee since, without being absolutely inaccurate, it is certainly calculated to lead to basically incorrect conclusions as to what the real opinions of many members of the Committee were.

INDIRECT PROFITS FROM MOTOR TAXATION.

The soundness and efficiency of most trading organisations can be best gauged by an examination of a complete financial statement of results. These are a reliable guide as applied to an organisation regarded as a whole, but they may be very misleading when applied to one section of an organisation considered separately. Thus from time to time we find too strong a tendency to estimate the degree of success attending the operation of motor vehicles purely by a study of figures relating to the actual costs incurred and the revenue directly resulting. In nearly every case motor vehicles are operated not wholly or even mainly with a view to direct profit. Practically the only exception is to be found in the motor omnibus, char-a-bancs, and cab, but even when discussing the provision of public service traffic we ought, strictly speaking, to take into account not only operating costs and receipts, but also the indirect effects upon the community resulting from the presence of the vehicle on the road. If in providing public services the operators cause an unnecessary amount of traffic congestion, this is tantamount to laying a tax upon every other road user. Thus, in comparing two methods the commentator should not necessarily select the one which shows the lowest operating cost per passenger mile. It may be that its advantage in this respect is more than counterbalanced by the indirect disadvantage due to the congestion caused by its presence. This is really the fundamental point to be remembered in discussing the relative merits of the tramcar and of the motor omnibus.

When it comes to the use of motor vehicles in connection with trade or agriculture, one has to remember that the vehicles only form the machinery of one department in an organisation possessing other departments. In some cases the substitution of motor for horsed vans or lorries may lead to an increase in the cost of haulage or of delivery, but the fact that these motor vehicles are in use may react so much to the benefit of their proprietor's business as a whole that this additional cost is far more than covered by the profits resulting from increased turnover. Thus the farmer or fruit grower may get better prices because the motors can convey his produce to the markets more quickly and with less injury. The trader possessing motor vans has facilities for extending the area of his deliveries, and is thus enabled to serve customers at a greater distance and so to expand his business. Again, the existence of motor vehicles may have an appreciable effect upon land values, increasing the value of agricultural land situated in districts which have hitherto been inaccessible for lack of railway communication. To take an obvious case by way of illustration, let us imagine an estate to include an attractive strip of coast a few miles from some busy watering-place, but having no railway connection. The owner of such an estate would be justified in running a regular omnibus service at his own expense, connecting up his property with the railway. Even if such a service represented a considerable annual loss when operating costs were set against receipts, its effect would be to increase the value of his property immensely as building land, and to accelerate the development of what had only been farm land into the site of a very considerable seaside resort.

CLASSIFICATION OF ROADS.

In a letter to London local authorities, Sir Henry P. Maybury, Director General of Roads, states that he is directed by the Ministry of Transport to inform the Council that under the provisions of Section 17 (2), Ministry of Transport Act, 1919, the classification of roads within the county of London will now be proceeded with. The roads will be divided into three classes, (i.) first class, (ii.) second class, (iii.) all other roads. No precise definition can be laid down as to the roads which will be included in the respective classes, but streets which are within the county of London which are not of an arterial character will not be considered for classification as first or second class except under very exceptional circumstances. It is suggested that it would greatly facilitate the work if conferences are arranged by the Council of each Metropolitan Borough and their surveyor with the Councils of adjoining highway authorities and their surveyors, with a view to securing co-ordination of the proposals to be submitted.

LONDON'S OMNIBUSES AND TAXI-CABS.—The number of omnibuses licensed during the year ended March 31, 1919, was 3,316, and in the year ended March 31, 1915, 2,771. No new omnibuses of the larger type have been licensed this year, but two were licensed in 1919. The number of taxi-cabs licensed during the year ended March 31, 1920, was 5,716, and during the year ended March 31, 1915, the number was 7,251.

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TAXATION & REGULATION OF VEHICLES.

RECOMMENDATIONS OF THE DEPARTMENTAL COMMITTEE.

Sir H. Maybury's Departmental Committee on the Taxation and Regulation of Road Vehicles have presented to the Minister of Transport their recommendations, which it is understood are the basis of the proposals embodied in the Budget. The report is signed by all the members, with the exception of Mr. Cooke, the secretary of the Automobile Association, and the principles of the proposals are as follow—

1. Abolition of the motor spirit duty.

2. A new method of assessing the license duty to be paid on mechanically propelled vehicles, namely,

(*a*) Motor cycles according to category.
(*b*) Private motor cars on horse-power.
(*c*) Commercial goods vehicles on unladen weight.
(*d*) Hackney vehicles on seating capacity.
(*e*) Other commercial and agricultural vehicles on unladen weight.

The problem before the Committee was the raising of an annual net revenue, provisionally estimated at £7,000,000, which, after payment of the contemplated contributions by the Central Government towards the maintenance of the first and second class roads, would still leave in the hands of the Ministry of Transport a sufficient sum to enable a substantial measure of new road construction and road improvement to be undertaken forthwith. The Chancellor considered that the petrol tax was not a satisfactory means of providing the revenue required.

In view of the financial needs of the country the Committee recognise that they cannot but acquiesce in the view expressed by the Chancellor of the Exchequer, although contrary to the true opinion of many of the members. These members think that, having regard to the importance of cheap transport facilities to the prosperous economic life of the people, it is unsound in principle to place any special tax upon transport agencies which in the nature of things must largely be passed forward in higher rates of fare or charge. They look forward to an opportunity of reopening the whole question when conditions shall have improved.

Advocacy of a State Policy for Fuel.

The report records the view of the Committee that the adoption of a substituted means of taxation for the motor spirit duty should be concurrent with the adoption of a State policy with regard to petrol supplies first and petrol prices second, which will secure to users petrol in adequate quantities on the most favourable terms possible in relation to current world price, controlling all such elements in the price as come within the range of Government action. They think that the most ready means to ensure a satisfactory fuel position would be for the Government to encourage in every practical manner the production and use of alternative motor fuels, and the development of home and Empire-produced petrol, benzol, and power alcohol. Unless such action be taken forthwith they fear that the combined effect of additional taxation and rising prices of motor spirit will impose so great a burden on mechanical road transport that it will have a most serious effect by increasing the cost of transport and agricultural operations.

The Committee recommend that unless the circumstances involve abnormal costs, payments by statutory and private omnibus undertakings to road authorities in respect of maintenance and adaptation of roads over which they run their omnibuses should cease.

Single Tax Proposal and Its Advantages.

In advocating a single tax system based upon an agreed classification of mechanically-propelled vehicles, the report states that the principal advantages are that it is clear in its incidence and difficult of evasion. The disadvantage is that the lower the annual mileage the more the taxation cost per mile, but a scheme of quarterly licenses has been devised which will largely meet this objection where seasonal causes govern the mileage run. The following is a summary of the recommendations—

(*a*) That a single tax based on the vehicle in accordance with the scale of duties set out below be adopted.

(*b*) That the principle involved in the allowance of rebates is an undesirable one, and should not be continued except in the case of private cars, the engines of which were constructed prior to 1913, in respect of which there should be an allowance of 25 per cent.

(*c*) That the entire proceeds of the proposed single-tax system (less certain expenses and payments to local authorities) should be devoted to maintenance, improvement, and construction of roads and bridges.

(*d*) That the proposed single tax should be the sole tax or levy for Imperial or local purposes to be imposed on the use of mechanically propelled road vehicles.

(*e*) That all payments to local or police authorities for registration of vehicles, and the licensing of hackney vehicles, should be included in the new duties when they came into force, the costs incurred by local or police authorities in connection with registration and licensing and supervision as hackney vehicles being borne by the Road Fund.

(*f*) That if the scheme of taxation is adopted no further payments should be made to road authorities by statutory and private omnibus undertakings in respect of maintenance and adaptation of roads over which omnibuses run unless the circumstances involve abnormal costs.

(*g*) That in the event of any duty or excise being charged for administrative or fiscal reasons on power alcohol or other new motor fuel or mixtures thereof used for road traction purposes, such duty or excise shall be recoverable in full by any consumer who has paid the statutory vehicle duty.

(*h*) That a small committee be appointed under the Ministry of Transport to report annually as to the revision, if any, which may be desirable in the proposed scale of duties, and to act in an advisory capacity with regard to the levying and collection of the duties.

(*i*) That fees for motor drivers' licenses, and any penalties recovered for keeping vehicles without proper licenses, should form part of the moneys to be made available for roads, and that the whole costs incurred in connection with the issue of the licenses and the recovery of the penalties be treated as part of the general costs of collection and paid out of the Road Fund.

(*j*) That the proposed new duties should come into force on January 1, 1921.

The Proposed Rates of Duty.

Subjoined are the proposed rates of duty with the exception of those for motor cycles and bath chairs—

1. All licenses to expire on fixed dates—yearly licenses on December 31 and quarterly licenses on March 31, June 30, September 30, and December 31.

2. A vehicle used for different purposes shall be liable to duty at the highest rate payable for any of the purposes for which it is at any time used during the current license period.

3. Fees now charged by local authorities on registration and transfer of vehicles to cease to be payable.

4. The "rate suggested" below is the full annual rate.

Hackney Vehicles.

	Rate Suggested. In Metropolitan area*	In other Districts.
A—Tramcars—To be chargeable as hackney carriages as at present	15s. ...	15s.
B—Other Hackney Vehicles—		
Seating capacity 1- 5	£15 ...	£12
,, 6-14	30 ...	24
,, 15-20	45 ...	36
,, 21-26	60 ...	48
,, 27-32	72 ...	60
,, Over 32	84 ...	70

*And such other districts as the Minister of Transport may define.

Notes.—(1) Electrically propelled private cars to pay duty as motor omnibuses. (2) Quarterly licenses to be permitted (except for tramcars) on payment of 20 per cent. above one-fourth of the annual duty. (3) Tramcars.—A reduction of 50 per cent. if license taken out in the last quarter. Licensing fees as hackney vehicles to be paid as at present.

Commercial Goods Vehicles (including three-wheelers weighing 7 cwt. or over unladen).

Class.	Rate Suggested.
Not exceeding 12 cwt. unladen weight	£10
Exceeding 12 cwt. but not exceeding 1 ton unladen weight	16
Exceeding 1 ton but not exceeding 2 tons unladen weight	21
Exceeding 2 tons but not exceeding 3 tons unladen weight	25
Exceeding 3 tons but not exceeding 4 tons unladen weight	28
Over 4 tons unladen weight	30
Any of the foregoing with the right to draw trailer	2 (additional)

Notes.—(1) In ascertaining the unladen weight of electrically propelled vehicles, the weight of the accumulators is to be excluded (2) quarterly licenses to be permitted on payment of 20 per cent. above one-fourth of the annual duty.

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Other Commercial and Agricultural Vehicles.

Class.	Rate Suggested
Motor tractors (classed as heavy motor cars), inclusive of trailers	£21
Road locomotives and agricultural engines—	
Not exceeding 8 tons unladen weight	25
Exceeding 8 tons but not exceeding 12 tons unladen weight	28
Exceeding 12 tons unladen weight	30
Agricultural tractors used on roads for haulage solely in connection with agriculture—	
Exceeding 2½ tons, but not exceeding 5 tons unladen weight	6
Exceeding 5 tons	10

A "tractor" means a mechanically or electrically propelled engine which draws but does not itself carry any load except such as is necessary for its propulsion and equipment.

Quarterly licenses to be permitted on payment of 20 per cent. above one-fourth of the annual duty, except in respect of vehicles only liable to duty at 5s.

Locomotive ploughing engines, agricultural tractors not exceeding 5 tons unladen weight, or other agricultural engines, drawing necessary gear, threshing appliances, farming implements or supplies of fuel or water, shall pay a duty of 5s. per annum only, if not used on roads for other haulage work.

Other Licenses.

Class.	Rate Suggested
Driving licenses	5s.
Horse carriage licenses (including hackney carriages)	As at present.

Reforms in Registration System.

The scheme provides for the adoption of a uniform system of levying and collecting the duties throughout the United Kingdom, and for the combining of registration and licensing and the abolition of registration fees. As the proceeds of the duties are to form a road fund, it is considered desirable that the responsibility for the supervision of the levying and collection of these duties should be vested in the Minister of Transport, and that to assist him a small standing advisory committee should be appointed.

Under the scheme proposed no vehicle can be on the road unless a license is in force for it, without the fact being advertised by its not carrying the proper card. This will render evasions very difficult, and reduce the costs of levying and collecting. The convenience to the public of being able to obtain licenses at post-offices is retained so far as renewals are concerned, thereby also widely distributing the large amount of work which will have to be done consequent upon the addition of licensing of commercial vehicles, and the introduction of quarterly licenses. It is hoped that the scheme may be adapted so as to check the traffic in stolen motor vehicles.

Estimate of the Proceeds.

The report gives the following estimate of the proceeds of the proposed new rates of duty—

England and Wales.

	Number	Revenue.
Cycles	265,000	£850,000
Private cars	210,000	£3,300,000
Hackney vehicles	70,000	£1,125,000
Commercial goods vehicles	100,000	£2,190,000
Other commercial and agricultural vehicles	7,500	£110,000
Other Licenses.		
Horse carriage and motor drivers' licenses		£450,000
		£8,025,000
Add one-eighth for Scotland and Ireland		1,000,000
		£9,025,000
Less Prior Charges.		
Costs of collection	£300,000	
To be paid to local authorities in lieu of carriage licenses	£600,000	
		£900,000
Estimated net proceeds		£8,125,000

A note attached to the report by the Ministry of Transport points out that in order to arrive at a proper comparison it is necessary to add to the existing license duty the amount of duty paid on the petrol consumed (namely, 6d. per gallon), and to set off against the proposed license duties the saving that will be effected by the decrease of 7d. per gallon in the price of petrol consequent upon the abolition of the tax.

Views of Parliamentary Motorists.

The scheme of taxation for motor vehicles put forward in the Budget was considered at a meeting of the Parliamentary Road Transport Committee held on April 23, under the presidency of Sir W. Joynson Hicks, M.P. A resolution was passed, almost unanimously, expressing the opinion that, as regards vehicles in which liquid fuel is used, the only fair method of taxation for the upkeep of roads is a tax on petrol. The Committee requested that the impossibility of the collection of this tax should be definitely proved to Members before they supported the Budget proposals. The meeting considerd that by taxing petrol the home production of fuel would be encouraged, and the dangers of a petrol shortage averted.

The Parliamentary Transport Committee appear to be acting in the interests of the private motorist, as set forth by one of the motoring organisations, which urges that even if the petrol companies take off the 6d. tax the average car owner will still have his car tax increased about fourfold.

Attitude of Commercial Users.

On behalf of the Commercial Motor Users' Association it has been stated that they do not consider the tax on commercial vehicles to be unreasonable. The association have never had any objection to a reasonable tax provided that the whole of the proceeds should be devoted entirely to the maintenance and upkeep of good roads, and also that if the suggested £1 per horse-power duty on private cars was reduced to 15s., as had been suggested in some quarters, their scales would be correspondingly reduced.

Owners of omnibuses and coaches look for a saving by the abolition of the war tax of 6d. per gallon on petrol, and they anticipate being able to pass on any extra expense by raising their fares. Some difficulty is anticipated in the case of the coach owner if he decides to take out only a quarterly license, and does not use his vehicle in the winter. In such a case emergency orders could not be taken advantage of.

Intentions of the Petrol Companies.

On April 16 the Shell Marketing Company, Limited, announced their intention to take off not only the 6d. petrol duty, but the additional penny which they estimated to be the cost to them of the routine work of collecting the tax for the excise officers. The price of No. 1 Shell spirit will therefore be 3s. 1½d. to the consumer, the price at which he could buy it during the summer of last year, when his tax was much lower than it is now going to be.

One of the leading petrol importing companies regards the proposals as the only possible course that could be taken to raise the large amount of money required for the upkeep of the roads. Petrol users who said they preferred the tax based on petrol consumption to a tax on horse-power were advocating—probably unconsciously—a 1s. 6d. per gallon tax on petrol, in view of the amount of money necessary for the roads. If, in order to raise the necessary amount, the petrol tax had been increased to 1s. 6d., a gallon, the price of No. 1 petrol would have become 4s. 8½d. a gallon. A similar rise would have occurred in the case of benzol, as its value as a fuel must be based on the price of petrol. About 50,000 tons of benzol are consumed yearly for motor purposes, representing 12,500,000 gallons. The consumers of benzol for motor power would have had to pay £625,000 a year more in consequence of the increase in the petrol tax, but not one penny of this would have gone towards the roads

The Budget Agreed To.

The House of Commons on April 27 agreed to the resolution embodying the new rates of duty on vehicles in the Budget to come into force on January 1 next.

Mr. Wedgwood was among the Members who opposed the resolution on various grounds. He complained that vehicles used for ordinary distribution would pay more than twice as much as similar vehicles used on farms. These duties would all be transferred to the consumer. The heavy duties on chars-a-bancs would prevent people going in them for a holiday.

Replying on various points, Sir E. Geddes said the tax was designed to raise £8,000,000 a year for the improvement of roads. To raise this amount on petrol would mean raising the tax from 6d. to 1s. 2¼d., and the petrol tax was very costly to collect and easy to evade. The Committee that considered this matter came to the conclusion that a tax on tires was impracticable. The Automobile Association was the only outside body that objected to the tax as proposed. The users of commercial vehicles were those primarily affected by the tax, and they did not object because the result would be that they would get better roads. They recognised that bad roads were the greatest enemy of their trade.

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MOTOR TRAFFIC

A NEW TYPE OF OMNIBUS BODY.

IMPROVEMENTS BY A LONDON MAKER.

Mr. W. J. Hickman, of 162, Grosvenor Road, S.W.1, is animated by a desire to improve the appearance and utility of passenger-carrying vehicles. For that purpose he has patented a new light weight omnibus, the design of which is shown in the following drawing. At intervals since February, 1918, he has directed the attention of the Commissioner of Police and others to the advantages of his proposals, but until recently he had not taken any practical step for testing his contentions, viz., arranging for a trial of the body he has designed. It is of interest, therefore, to learn that definite arrangements have now been made with the General Seating Company, Limited, of 162, Grosvenor Road, S.W.1, for building a number of Mr. Hickman's new light weight omnibuses, one of which will shortly be available for inspection and trial.

Upon two of his contentions there would seem to be no room for difference of opinion. The first is that his shapely body is preferable to what has become the standard type of public passenger vehicle, and the second is that its narrower width renders it less liable to collisions with lamp posts and other vehicles. Mr. Hickman's design is apparently intended to accommodate 46 persons, the same number as is carried in the new type of the L.G.O C., and he claims to have produced a body of equal strength to the product of the Walthamstow works. The chief advantages which Mr. Hickman claims for his design when compared with the old standard type of omnibus may be set out as follows—

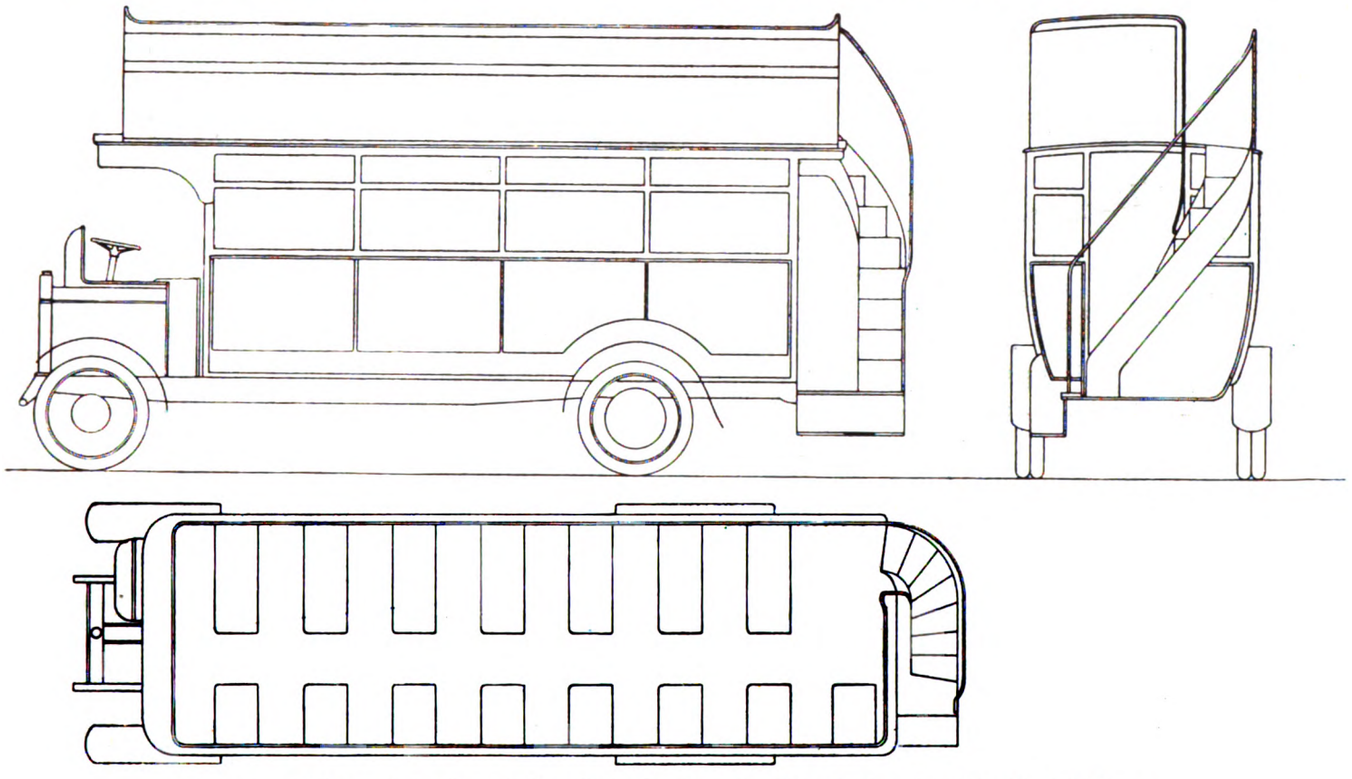
1. The driver should be positioned beside the engine, as in the old type of omnibus he occupies enough chassis space to provide seating accommodation for ten passengers. This would redistribute the weight as between the front and rear axles, prevent whipping of the chassis due to the body being balanced on the rear axles, and also lower the centre of gravity, as it would permit a greater relative number of seats in the interior of the vehicle.

2. The load line or chassis frame should be from four to eight in. lower in order to lower further the centre of gravity. If the load line cannot be reduced without a concession from the licensing authorities then new regulations with a minimum of 6 in. ground clearance should be incorporated.

3. Reduction of weight both in the chassis and body. Mr. Hickman is of the opinion that bodies built to his design would effect a saving in weight of about 5 cwts., and that if his suggestions were carried out, they would result in a further reduction of weight in the chassis of about 3 cwts.—this with the standard 34-seat omnibus. In the design illustrated, Mr. Hickman has taken advantage of the increased laden weight now permitted under the London Police regulations.

4. The improvements in the body design and construction of omnibuses put forward by Mr. Hickman cover increased comfort and safety for passengers and also the protection of public property in the form of tramway and lighting standards.

The drawing here produced shows a chassis similar to the L.G.O.C "K" type. The body is 8 in. narrower across the frame and 14 in. narrower across the top deck than any other type of double deck omnibus, and complies with Mr. Hickman's contention that in no case should the breadth of the top deck exceed the width of the centre lines of the outer of the rear twin tires or its equivalent if single wide section tires are used.



Elevation and Plan of Omnibus Body without Overhanging Top Designed by Mr. W. J. Hickman.

The outside breadth and available gangway widths in this comparatively narrow omnibus are as follows—

Outside width of top deck	5 ft. 11 in.
Outside width of body	6 ft. 2 in.
Top deck gangway width	1 ft. 3 in.
Inside gangway width	1 ft. 0 in.

The appearance of a specimen of this type of omnibus will be awaited with interest; it certainly appears to embrace a number of features well worthy of consideration.

In addition to the type of body here illustrated Mr. Hickman has designed a similar body but with the top seats sunk to the extent of 8 in. below the camber of the roof. The obvious advantage of this arrangement being to still further lower the centre of gravity, and thus add very considerably to the safety of running double-deck omnibuses on indifferent roads.

THE INSTITUTION OF AUTOMOBILE ENGINEERS.—The last ordinary general meeting of the session of the Institution of Automobile Engineers will be held on Friday, May 14, at the Technical Institute, Coventry, at 7.30 p.m., when a lecture entitled "Why Petrol must go Higher in Price," will be given by Dr. W. R. Ormandy. Cards of invitation to the meeting may be obtained on application to the Secretary, the Institution of Automobile Engineers, 28, Victoria Street, London, S.W.1.

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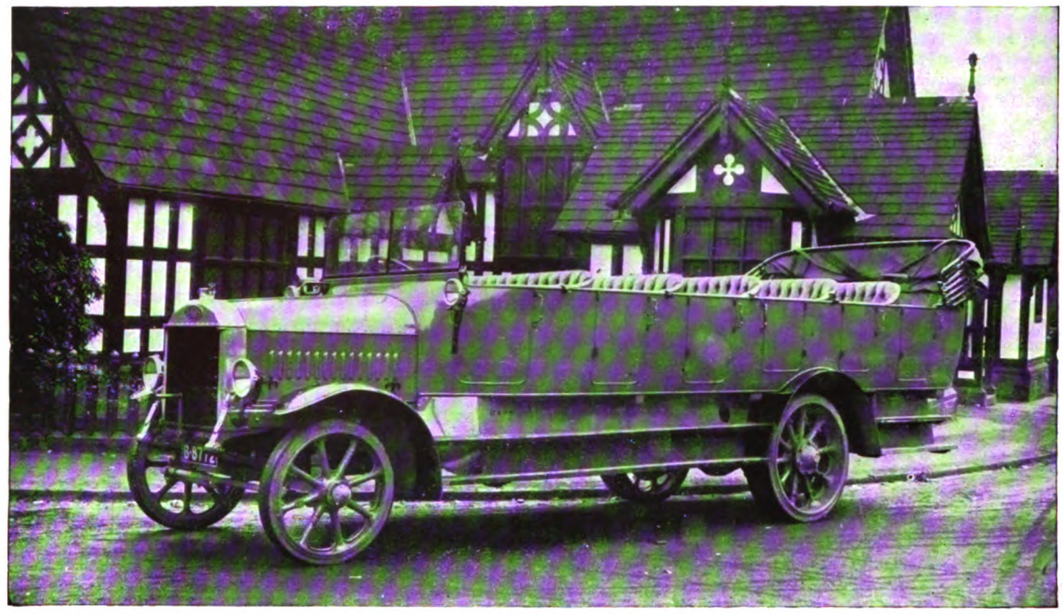
MOTOR TRAFFIC

ENTERPRISE OF LANCASHIRE UNITED TRAMWAYS

The motor coach department of the Lancashire United Tramways, Limited, has entered upon what promises to be the most successful season of its history. As fast as delivery can be secured, Mr. E. H. Edwardes, the manager and engineer of the company, is adding to the fleet of coaches, which will shortly exceed thirty in number. The vehicles seat 14 and 28 passengers, and for the smaller cars the charge is slightly higher. Illustrations of the larger vehicle are given on this page. Both types are run for private parties' visits to North of England and Welsh pleasure resorts. By means of booking offices in various centres, combined with newspaper advertising, wide patronage is secured for short trips and extended tours arranged by the tramways management. Both classes of traffic is stimulated by keeping before the public eye the dates fixed for various sporting and other interesting events.



Lancashire Tramway's Dennis 28-Seat Coach.

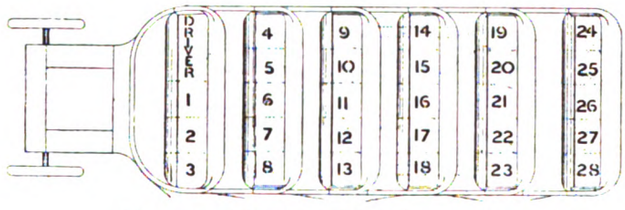


Diagram of Seating of Dennis Coach.

L.G.O.C.'S "FREEDOM FROM ACCIDENTS" CHALLENGE SHIELD.

The London General Omnibus Company's challenge shield for "Freedom from Accidents" has been presented to the Streatham garage of the company for the second year in succession. This competition between the garages was first instituted in 1913, when street accidents in London had reached an alarmingly high figure. Since then, so far as the L.G.O.C. is concerned, there have been encouraging results in the shape of a steady annual decline in accidents, with only one set-back. There is no doubt that the competition promotes among the company's employees a personal interest in maintaining "Freedom from Accidents," and there is also the incentive of personal regard, not only in connection with the custody of the shield, but in the award of bonuses for safe driving. These awards reached £19,906 for the year 1919.

ROADS IMPROVEMENT ASSOCIATION.

That the formation of a roads department of the Ministry of Transport has not lessened the necessity for the existence of the Roads Improvement Association will be apparent from a perusal of the report for 1919-20. This document was presented at the 33rd annual meeting held on April 28, under the presidency of the Hon. Sir Arthur Stanley, at the Surveyors' Institution.

In the past the association has been a cradle for men who have become prominently identified with roads. Its first hon. secretary was Mr. Rees Jeffreys, who became the first secretary of the late Road Board, while Sir H. Maybury, the director-general of the roads department of the Ministry of Transport, was engineer and manager to the Road Board. Before he entered upon those duties he was county surveyor of Kent, in which capacity he gave support to the trials of road materials carried out under the auspices of the R.I.A. Mr. W. E. Riche, the present secretary of the association, had the privilege of serving under Sir Henry Maybury while he was director-general of roads to the British Army in France.

Interest in road questions having now greatly broadened, the association has widened its constitution, with the result that its income from membership has exceeded the level of the best pre-war balance sheets. A much larger measure of financial support is, however, needed to enable the committee to meet the expense of its enlarged programme. The wide appeal which the association makes to road users is shown by funds for the past year having been subscribed to the extent of over £1,297 by various organisations and trade associations, commercial and industrial associations, local authorities and individual and general traders. There is need for more individual membership subscriptions, these having produced only £35.

An effort is being made to revive the district associations which did useful work prior to the war, and with that object the association is promoting conferences and public meetings, at which schemes are promoted to secure regional improvement which are intended primarily to benefit through traffic. In the great industrial area of the West Riding a committee has been appointed by several local authorities to formulate a definite scheme.

OMNIBUSES FOR PRIVATE PARTIES.—The London General Omnibus Company, now that their war-shortened fleet is regaining its pre-war strength, are able to accept orders for motor omnibuses for private parties. These omnibuses have seats for 34 passengers. The company expect early delivery of a number of chars-a-bancs peating 28 persons, which will be suitable for smaller parties. Applications should be made to the Passenger Agent, Private Hire Department, Electric Railway House, Westminster, S.W.1.

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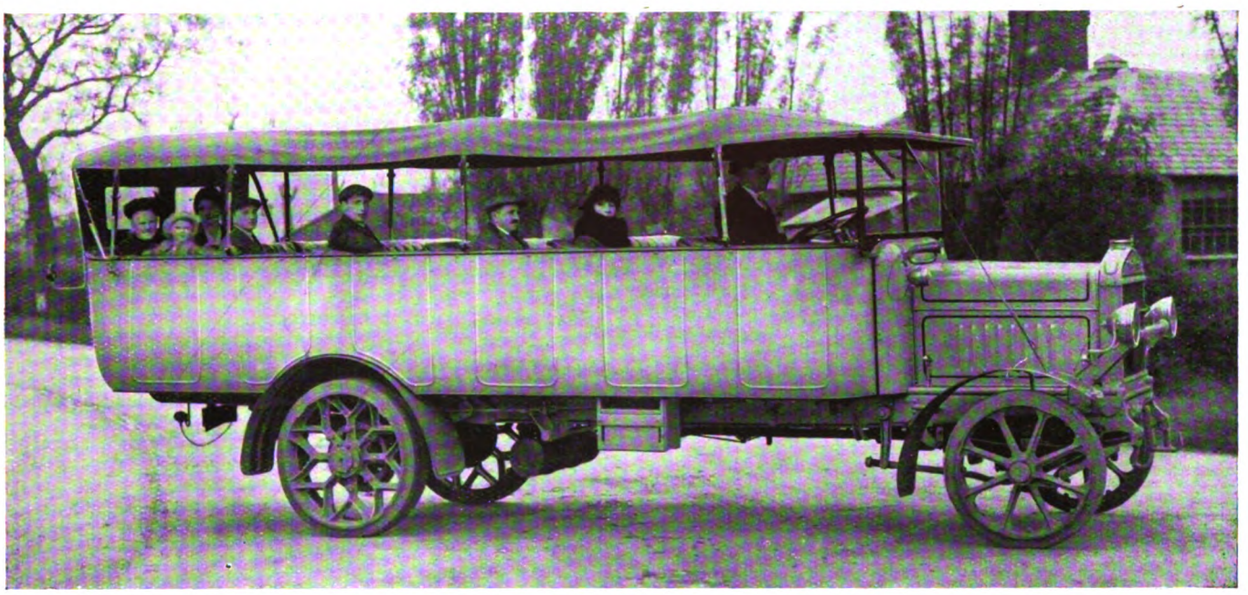
MOTOR TRAFFIC

"STRAKER" CHAR-A-BANCS FOR THE ISLE OF MAN.

The handsome type of char-a-bancs shown in the accompanying illustration has been entirely built at the works of Messrs. Straker-Squire at Edmonton. It is arranged to seat 30 passengers, and will be used for tourist traffic in the Isle of Man. The chassis is the Straker-Squire "C.O." type, a machine which earned an excellent reputation in pre-war days for its reliable and economical running in passenger services in all parts of the country. Designed for a load of three tons exclusive of the body, it has an overall length of 19 ft. 6½ in., with a wheel base of 13 ft. 6 in. It is worthy of note that the standard char-a-bancs body, which will be fitted to the new 55-h.p. "A" type chassis which Messrs. Straker-Squire are just placing upon the market, will seat 35 passengers.



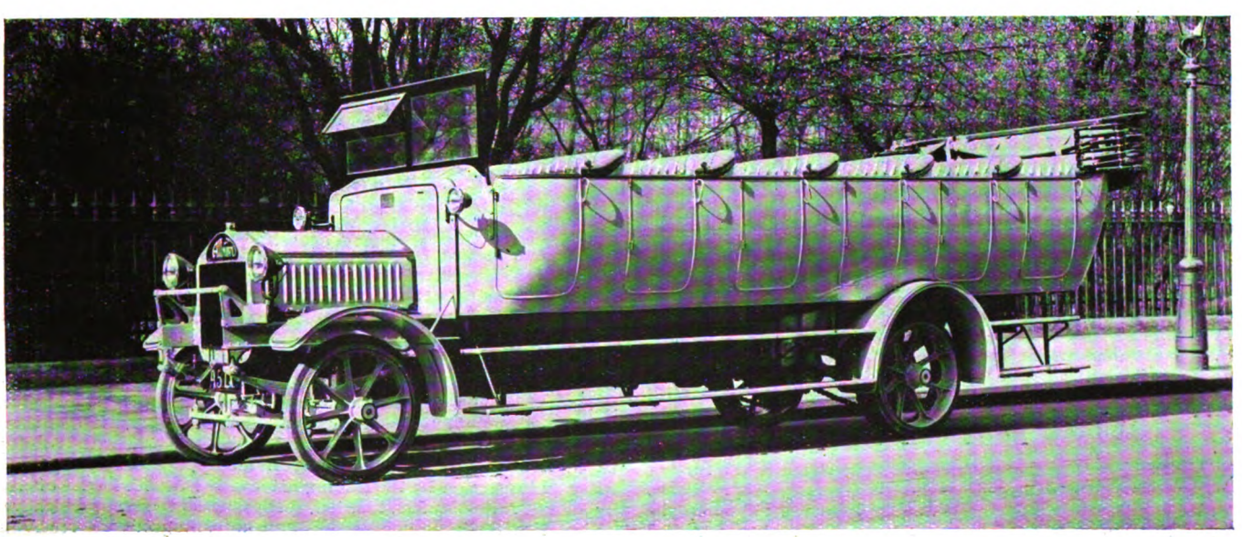
Straker Char-a-bancs for the Isle of Man.

NEW OMNIBUS SERVICES.

Wallasey Corporation tramway department on April 2 inaugurated their motor omnibus services by taking an invited party to Harrison Drive and West Kirby. On the same day a 15-minute service was started between Seacombe and Harrison Drive, *via* Egremont, Liscard Village, and Wallasey Village. Six omnibuses have been secured, and four are run daily, the remainder being for developments. Councillor F. Howse, chairman of the Tramways Committee, informed the guests that the tramways had made enormous progress since electrification in 1902. It was now proposed to develop motor services on cross-town routes. As Birkenhead Corporation was not going to run a service between Seacombe and Birkenhead, the committee would be lacking in their duty if they did not take steps to themselves supply this public need. Lieut.-Col. Greene (tramways manager) remarked that there were great potentialities for omnibuses in the district. Both tramways and omnibuses had an important sphere of usefulness, and he saw no reason why both services should not be equally successful.

RHYL COUNCIL have granted the use of a stand for setting down and taking up passengers by omnibuses running from Birmingham to Llandudno.

SOUTHAMPTON CORPORATION TRAMWAYS COMMITTEE have ordered three single-deck omnibuses for the purpose of extending the services at present carried on with double-deck vehicles. The management consider that the new type will be more suitable for all weathers, besides proving economical in operation. The Watch Committee recently recommended that a licence be granted for twelve months to Mr. W. F. French to run single-deck omnibuses, but the Cor-



An Albion Char-a-bancs.

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MOTOR TRAFFIC.

poration have deferred their decision in order to consider proposals for imposing a charge for road maintenance.

ROTHERHAM CORPORATION TRAMWAYS COMMITTEE are to be allowed to run omnibuses in the outside areas on payment to the Rotherham Rural Council of £140 for one year and 3d. per omnibus mile. Owing to shortage of omnibuses, the Corporation have discontinued Sunday services, but as soon as more vehicles have been obtained the weekday services will be augmented.

BRISTOL TRAMWAYS AND OMNIBUS COMPANY have inaugurated an omnibus service for passengers and parcels between Gloucester and Cinderford, covering a route of twenty miles each way.

THE BRITISH AUTOMOBILE TRACTION COMPANY have started an omnibus service between Windsor and Staines. Surrey County Council and Chertsey Rural Council are demanding a payment of 1d. per omnibus mile.

BOURNEMOUTH CORPORATION OMNIBUSES.

FINANCIAL RESULTS FOR THE YEAR ENDED MARCH 31, 1920.

The following is a summary of the motor omnibus accounts of the Bournemouth Corporation Tramways Department for the last financial year.

EXPENDITURE.

	Average per 'bus mile.	£ s. d.	£ s. d.
TRAFFIC EXPENSES—			
Traffic wages	5·17	269 2 5	
Cleaning, oiling, and shed maintenance	1·37	71 9 2	
Ticket check	·16	7 17 9	
Uniforms	·24	12 0 0	
Petrol	11·39	593 1 0	
Licences and miscellaneous	·16	8 6 0	
War bonuses	4·42	231 6 8	
	22·91		1,193 3 0
GENERAL EXPENSES—			
Salaries and establishment	1·83	100 0 0	
Rent, rates, and taxes	·50	25 0 0	
Printing and stationery	·15	6 11 5	
Accident Insurances and compensation	1·96	101 4 6	
Miscellaneous	·12	4 13 9	
	4·56		237 9 8
REPAIRS AND MAINTENANCE—			
Tires	·75	39 5 11	
Bodies and chassis	2·52	131 2 9½	
Tools and machinery	·02	1 3 8	
Miscellaneous	·07	3 8 7	
	3·36		175 0 11½
Total working expenses	30·83		£1,605 13 7½

INCOME.

TRAFFIC REVENUE—			
Passengers' fares	—	1,189 14 7½	
Parcels	—	2 6 0	
Hire of omnibus	—	3 0 0	
	22·94	1,195 0 7½	
SUNDRY REVENUE—			
Advertising	—	27 16 0	
Miscellaneous	—	0 13 10½	
	·55	28 9 10½	
	23·49		£1,223 10 6
Working loss on omnibuses	7·34		£382 3 1½
	30·83		

ROADS FOR OMNIBUSES.

GOVERNMENT INTERCESSION FOR THE LONDON COMPANY.

The General Purposes Committee of the Leyton Urban District Council report receipt of a letter from the Ministry of Transport Development Department, intimating that the Advisory Committee on London Traffic express the hope that the Council will be able to see their way to put certain roads into a condition which will enable the omnibus service between Colney Hatch and Muswell Hill and the "Green Man" (Leytonstone) to be restored. The committee have referred the letter to the surveyor, but at the same time recommend that the Council should express a protest against a Government department approaching the Council on behalf of the London General Omnibus Company in the matter.

ALBIONS FOR SOUTH AFRICA.

The Albion Motor Car Company, Limited, have received a further order from the South African Government for six 50-cwt. chassis. The order is interesting evidence of the splendid work done by the Albion lorries under the severest conditions for motor transport during the campaign in German East Africa.

MOTOR VEHICLES FOR MUNICIPALITIES.

KENILWORTH URBAN COUNCIL are purchasing a tipping wagon.

GLASGOW TRAMWAYS COMMITTEE have purchased two 2-ton lorries.

BOLTON CORPORATION are purchasing a fire engine from Leyland Motors, Limited.

MANCHESTER WATERWORKS COMMITTEE have purchased a 4-ton Daimler lorry.

ROTHERHAM CORPORATION have received sanction to borrow £2,636 for the purchase of lorries.

GALASHIELS COUNCIL have placed an order with Messrs. Dennis Brothers, Limited, for a fire engine, at £1,675.

MARYLEBONE COUNCIL are purchasing two Austin chassis with water tanks for road watering at a cost of £850 each.

DERBYSHIRE COUNTY COUNCIL have decided to obtain two motor rollers and six steam and three petrol wagons at a cost of £12,810.

WALTHAMSTOW HIGHWAYS COMMITTEE recommend the purchase of three 5-ton, one 3-ton, and one 1-ton secondhand motor lorries.

MANCHESTER WATCH COMMITTEE have accepted the tender of Crossley Brothers, Limited, Manchester, for the supply of an ambulance.

MANCHESTER ELECTRICITY COMMITTEE have accepted the offer of the Electromobile (Leeds) Limited, for the supply of a 15-cwt. electric van.

PLYMOUTH TRAMWAYS COMMITTEE have accepted the tender of Messrs. Mumford and Son for the supply of twenty omnibuses at £1,725 each.

CHELMSFORD COUNCIL have asked the borough engineer to prepare a report with regard to the substitution of mechanical for horse-drawn vehicles.

WINDSOR CORPORATION have ordered a motor fire engine from Messrs. Dennis Brothers, at £1,550, of which H.M. Board of Works is contributing £550.

NELSON COUNCIL are purchasing a street sweeper and cesspool cleaner, consequent upon a report of the successful working of a similar machine at Huddersfield.

EXETER CORPORATION propose to obtain three electric vans for the collection of refuse. By this means it is estimated that the cost will be reduced £600 or £700 per annum.

ROTHERHAM CLEANSING COMMITTEE have recommended acceptance of Messrs. Mossay and Company's tender for the supply of two Orwell electric vehicles at £1,340 each.

ESSEX COUNTY COUNCIL are purchasing four Foden steam lorries from the Disposal Board at £1,000 each, subject to the county engineer being satisfied as to the condition of the vehicles.

SALFORD ELECTRICITY COMMITTEE recommend the purchase from the Disposal Board of two Foden wagons at £500 each, and two Straker-Squire lorries, one at £450 and the other at £400.

ST. PANCRAS HIGHWAYS COMMITTEE have recommended the purchase of two 3½-ton Orwell electric wagons with interchangeable water tank bodies at £1,673 each, and two Lacre motor road sweepers at £650 each.

KENSINGTON COUNCIL, following a demonstration by a Straker-Squire petrol-driven gully emptying machine, have been recommended by the Works Committee to purchase a similar machine at a cost of £1,250.

BRADFORD WORKS COMMITTEE have empowered their chairman and the city engineer to inspect a sweeping and loading machine suitable for attachment to a motor or steam wagon, and purchase it if found satisfactory.

HAMMERSMITH COUNCIL expect to save over £4,000 a year in the cost of refuse collection by substituting motor for horse vehicles. The Council's Highways Committee recommend the purchase of six 3½-ton Orwell electric vehicles at £1,556 each.

A PLYMOUTH CORPORATION deputation visited Birmingham and Sheffield to inspect electric vehicles collecting refuse. As a result the Works Committee have recommended the Corporation to purchase three electric vehicles, two tipping wagons, one gully cleaner, and a sweeping and loading machine, at a cost of £12,842.

HULL WORKS COMMITTEE received a very large number of offers of secondhand vehicles, of which the most favourable appeared to be one from Auto-Traders, Limited, London, for three A.E.C. 4-ton lorries with subsidy pattern bodies, reconstructed by themselves at £775 each, and an offer from Morrell and Company, Hull, of three Thornycroft lorries, reconstructed by the makers, with subsidy type bodies, at £947 10s., or with hydraulic tipping bodies, at £1,100. After an inspection by the leading fitter of the A.E.C. lorries offered by Messrs. Auto-Traders, Limited, it is proposed to accept whichever of the two tenders appears the more advantageous on receiving his report.

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MOTOR TRAFFIC

BRITISH STANDARD RUBBER TIRES AND RIMS.

At long last a definite understanding has been reached with regard to the fixing of standard sizes for both pneumatic and solid rubber tires. The need for reducing the great number of sizes of these tires has been apparent for many years, and individual manufacturers have strongly advocated this step without much result. Finally, the British Rubber Tyre Manufacturers' Association took the matter up, with the result that a scheme for the purpose was prepared and submitted to the Engineering Standards Association. This scheme, with certain modifications, has now been embodied in the report of the committee of the association, and accepted by the Manufacturers' Association. As the standard list of sizes is urgently required by the motor industry the present memorandum is issued as an interim measure pending the ultimate revision of the British Standard Reports. In the pneumatic section each class of tire and rim is dealt with, from juvenile cycles 22 × 1⅜ to the heavy motor car 40 × 8. In the solid section there are two ranges, metric sizes and inch sizes. In the former there are four rim sizes with a maximum of six widths ranging from 90 to 180.

In the inch sizes there are also four rim diameters, 26 to 34. The tire sections vary from 3 to 14, the maximum number being for the 30 in. wheel, which has seven widths varying from 3½ to 10.

Full details, with schedules and diagrams, are given in the British Standard List of Rubber Tires for British Standard Rims (C.L. 8,564, 1920), issued by the British Engineering Standards Association (price 1s.).

EX-SERVICE MEN'S VENTURE.

The omnibus illustrated below is one of the vehicles which the Lymington and District Motor Service Company, Limited, run between Lymington and Bournemouth. The route runs through some of the prettiest scenery in England, giving views of the Solent, the Needles, and charming country lanes.

This company is of special interest, because its undertaking was bought and is now run entirely by ex-soldiers who have served overseas, and it has grown in twelve months from a small business with two cars to a service employing three omnibuses, three 3-ton lorries, and six light cars and vans. It has one of the best equipped garages and workshops in the district. Chars-a-bancs trips are being arranged for the summer, and the company bids fair to become a large and successful undertaking.

MOTOR TRAFFIC NOTES.

ROAD FROM GLASGOW TO RENFREW.—The new road from Glasgow to Renfrew is estimated to cost £361,000. Of this sum the Ministry of Transport has offered to contribute £40,000.

COACH TRAFFIC AT ILFRACOMBE.—The local authority have granted licences to a company to run coaches and omnibuses, notwithstanding opposition from local owners.

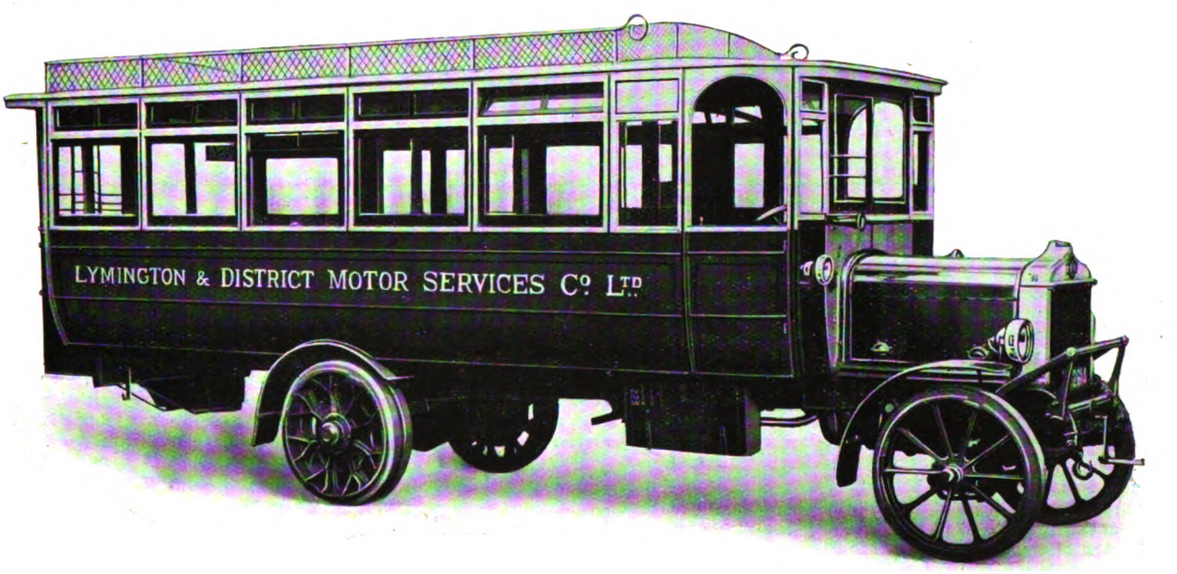
A Daimler Single-Deck Omnibus.

THE LIFE OF AN OMNIBUS.—Sheffield Tramways and Motors Committee have arranged that the depreciation on the motor omnibuses shall be based on a seven years' life.

THE ASSOCIATED EQUIPMENT COMPANY, LTD., by reason of the general increase in the cost of material and production, have been obliged to fix the selling price of the A. E. C. standard 3-4 ton chassis at £1,300.

BRITISH VEHICLES REQUIRED IN CANADA.—A company in British Columbia have asked the Department of Overseas Trade, 35, Old Queen Street, S.W.1, to put them into communication with manufacturers desirous of exporting lorries and touring cars.

MOTOR LORRY REFRIGERATOR SERVICE.—The Union Cold Storage have inaugurated a special service of refrigerator motor lorries to take a supply of frozen meat from its chief stores at Liverpool and to distribute it to many of the large towns in Lancashire.



An Omnibus Running in the Bournemouth District—Built by the Associated Equipment Company.

The omnibus shown in our illustration was supplied by the Associated Equipment Company, and has seats for 32 passengers. It is provided with a separate non-smoking compartment, and the windows can be drawn up and down as in railway carriage doors. The weight of the vehicle is five tons, the weight on the front axle being 2 tons, 9 cwt. 3 lb., and on the back axle 4 tons 19 cwt. and 2 lb.

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MOTOR TRAFFIC

No Satisfactory Mud Guard.—Mr. A. R. Fearnley, general manager of Sheffield Corporation tramways and motors, has reported to the Tramways Committee that he has not been able to discover a satisfactory guard for motor vehicles that will prevent mud splashing.

Omnibus Services Around Newcastle-on-Tyne.—Following the passage of the Newcastle Corporation Bill seeking powers to run motor omnibuses from Scotswood to Ryton, the mining villages of Crawcrook and Mickley have asked for the service to be extended to those places.

Extent of London Omnibus Service.—Lord Ashfield, managing director of the London Underground Group, has stated that of the entire traffic of the group—which includes the electric railways, three tramway systems, and the omnibuses—49 per cent. is carried by the omnibuses.

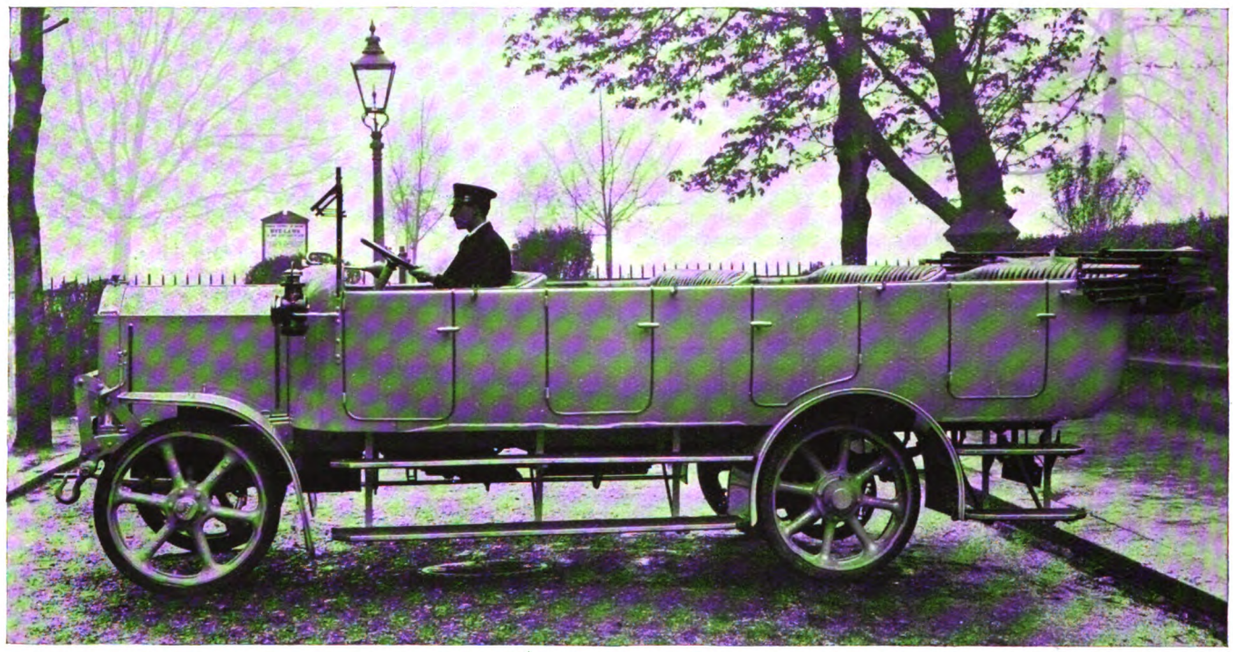
Omnibuses Proposed for Northampton.—The Tramways Committee have recommended the Corporation to obtain powers to run omnibuses to outlying districts. Tenders have been obtained from various firms for the supply of omnibuses, but the committee have deferred their decision.

has become very expensive, it is proposed to introduce motor vehicles as early as possible.

Census of Motor Vehicles.—In replying to a question in the House of Commons, Sir Eric Geddes said that no steps were being taken at present to compile a census of all motor vehicles in Great Britain. When the new proposals for the taxation of mechanically-propelled road vehicles came into force a satisfactory system of registration of such vehicles would result.

New Road from Glasgow.—Glasgow Corporation have submitted for consideration and report to the special sub-committee appointed in connection with the proposed road from Glasgow to Renfrew, a letter from the Ministry of Transport asking if the Corporation would be prepared to commence the construction of the proposed new road from Glasgow to Renfrew, estimated to cost £361,396, with the assistance of a grant of £40,000.

Preston-Garstang Omnibus Service.—Messrs. Foley and Company, Limited, of Preston, have inaugurated an omnibus service between that town and Garstang, with a Maudslay one-deck vehicle. The single journey occupies 48 minutes, the fare being



A Napier 2-Ton Business Vehicle Chassis Fitted with a Smart Char-a-bancs Body.

Road Paving for Omnibuses.—On the suggestion of the borough engineer, Islington Council have agreed to pave St. John's Road, which is much used by omnibuses, with lengths of Trinidite grout, asphaltmac, plascom and pitch grout as an experiment, at a cost of £732, before carrying out extensive repairs.

Withdrawal of Omnibus Services.—Owing to the bad condition of the roads from Chesterfield to Unstone, the Chesterfield Corporation have withdrawn the omnibus service. The withdrawal has affected the receipts of the Sheffield omnibuses between Unstone and Dronfield, with the result that this service is to cease.

Excessive Noises of Road Vehicles.—At present the police have only limited powers to deal with road vehicles making an excessive noise, but the question has been included in the terms of reference of a departmental committee of the Ministry of Transport on the taxation and regulation of road vehicles, and is being considered by them.

Swansea's Omnibus Scheme.—The Corporation have decided not to proceed in this session of Parliament with the motor omnibus clauses of the Corporation Bill. The Tramways Committee have been directed to insist upon the terms of the existing lease with the Tramway Company being carried out in regard to providing a better tramways service.

Motor Prison Vans.—While the leading municipalities of the provinces have operated motor prison vans for years, the prison administration of the Metropolis have been content with the huge, obstructive pair-horse conveyances. Now that horse maintenance

is. 3d. Owing to the popularity of the service, it has had to be augmented by the use of Maudslay coaches.

Omnibus and Cab Licensing in London.—The Home Secretary stated in the House of Commons on April 20 that during the year ended March 31, 1920, the number of motor cabs licensed in the Metropolis was 5,716, as compared with 7,251 in 1915. The number of omnibuses licensed during the first-mentioned period was 3,316, and in 1915 it was 2,771. No new omnibuses of the larger type had been licensed this year. Two were licensed in 1919.

Heavy Holiday Traffic at Blackpool.—The Corporation have appointed a sub-committee to consider the question of providing stations or parks for motor coaches to unload and remain until the return journey. The police reported that during the Easter holidays 250 coaches and over 2,000 private cars came into the town daily, and that at the week-end 700 coaches and 6,500 cars were counted entering the town. Great difficulty was experienced in finding places for them to unload and remain.

Tire Manufacturers and the Transport Ministry.—On April 26, Mr. Doyle asked the Minister of Transport whether the panel of experts to act as Advisory Committees of the Ministry of Transport Act, 1919, had been set up; and whether he had considered the advisability of inviting the British Rubber Tire Manufacturers' Association to nominate one of its members to act on this panel? Sir E. Geddes.—The answer to the first part of the question is in the affirmative. I shall be glad to invite the association referred to to nominate a member to act on the panel.

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THE Tramway & Railway World
WITH MOTOR TRAFFIC SECTION

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LAST STAND OF THE RECIPROCATING STEAM ENGINE.

A Paper presented to the American Institution of Electrical Engineers

By A. H. ARMSTRONG,
Chairman, Electrification Committee, American General Electric Company.

During the year 1920 the people of the United States will pay out for automobiles, not commercial trucks or farm tractors, but pleasure vehicles, a sum of money considerably greater than the estimated requirements of the steam railways for that year. The railways, however, may find it very difficult, and perhaps impossible, to secure the large sums needed without Government aid, notwithstanding the fact that the continued operation and expansion of our roads are of vital necessity to the welfare and prosperity of the country and all its industries. The will of the American public has always been constructive, and undoubtedly in due time its voice will be heard and properly interpreted by its representatives in Washington, with the resulting enactment of such laws as will permit the railways again to offer an attractive field for the investment of private capital.

The purpose of this paper is not to discuss the politics of the situation nor any necessary increase in freight rates that may be required to make the railways self-sustaining, but rather to offer certain suggestions as to the best manner of spending the sums that must ultimately be provided for new construction and replacements.

During the war period many lessons have been most clearly brought home to us, and not the least of these is that there is something inherently wrong with our steam railroads. During the three generations of its

Goods Trains on Chicago, Milwaukee and St. Paul Railway at the Entrance to Silver Bow Canyon.

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development, we have become accustomed to look upon the steam engine as properly belonging to the railway picture, and have given little thought to its wastefulness and limitations. It is around the steam locomotive that railway practice of to-day has gradually crystallised.

During the winter of 1917-18 American railways fell down badly when the need for them was the greatest in their history. It is true that weather conditions were unprecedented and the volume of traffic abnormal, but the weaknesses of the steam engine haulage were disclosed in a most startling and disastrous manner. Delayed passenger trains in cold weather can be endured by the travelling public in suffering silence or voluble expression, according to temperament; but the blocking of our tracks with frozen engines and trains, resulting in a serious reduction of tonnage in cold weather and a prohibitive delay in transportation of freight in times of great stress, is quite another thing, and plainly indicates the inability of the steam engine to meet overloads and adverse climatic conditions.

In marked contrast to the adjoining steam engine divisions, the 440-mile electrified section of the Chicago, Milwaukee and St. Paul Railway continued to do business as usual all through that trying winter of 1917-18. The electric locomotives brought both freight and passenger trains over the electrified tracks in schedule time or better; in fact, it was quite customary to make up on the 440-mile electric run fully two hours of the time lost by passenger trains on adjoining steam engine divisions. While the results obtained upon the Chicago, Milwaukee and St. Paul were perhaps more spectacular due to the greater mileage electrically equipped, other electrified roads contributed similarly attractive records. The reliability and permanency of the comparison between steam and electric locomotive haulage is sufficiently guaranteed therefore by the results of several years' operation to justify drawing certain conclusions regarding the merits of the two types of motive power. The following analysis of the railway situation is therefore offered for the purpose of exposing the fact that railroading to-day is in reality steam engine railroading, and the general introduction of the electric locomotive will permit fundamental and far-reaching changes being made in the method and cost of hauling freight and passenger trains.

The writer is not proposing the immediate electrification of all the railways in the United States, as many roads of lean tonnage would render no adequate return upon the large capital investment required, but is offering the following table of total operating statistics simply as a measure of the magnitude of the problem confronting us in the future. In the United States it should be noted, however, that we have during the past thirty years installed power stations equal to twice the estimated capacity required for the electrical operation of every mile of track to-day.

The tonnage passing over the tracks of our railways may be subdivided in a most interesting manner as shown in Table I.

TABLE I.—TOTAL TON-MILE MOVEMENT.
All Railways in United States, Year 1918.

	Per cent.	Ton-miles.
1. Miscellaneous freight cars and contents	42·3	515,000,000,000
2. Revenue coal cars and contents ...	16·23	197,000,000,000
3. Locomotive revenue, driver weight only	10·90	132,300,000,000
4. Passenger cars, all classes	16·13	196,000,000,000
Total revenue, freight and passenger	85·56	1,040,300,000,000
5. Railway coal	5·00	60,600,000,000
6. Tenders, all classes	6·50	78,800,000,000
7. Locomotive railway coal	0·39	4,700,000,000
8. Locomotive, non-driving weight ...	2·55	31,000,000,000
Total non-revenue	14·44	175,100,000,000
Grand total (all classes)	100·00	1,215,400,000,000

The first four items, representing 85·56 per cent. of the total ton-miles made during the year 1918, may be regarded as fundamentally common to both steam and electric operation. By introducing the electric locomotive, however, the last four items are reduced to the extent of completely eliminating items (6) and (7), reducing item (5) by possibly 80 per cent., and item (8) by one-half. Of the total of 14·44 per cent. affected therefore it may be assumed for purposes of comparison that approximately 12 per cent., or 146,000,000,000 ton-miles, at present hauled by steam engines over our roads, would be totally eliminated with electric locomotive haulage. This ton-mileage eliminated is equal to over 20 per cent. of items (1) and (2), representing the revenue producing freight traffic on our railways. In other words, if all our railways were completely electrified they could carry one-fifth more revenue producing freight tonnage with no change in present operating expenses or track congestion.

Map of Chicago, Milwaukee and St. Paul Railway Showing Electrified Sections (Broken Lines).
(These sections amount to nearly one-third of the distance from Chicago to the Pacific Coast.)

It is evident that the greater part of the tonnage reduction effected by electrification is included in items (5) and (6), representing the railway coal movement in cars and engine tenders. The steam engine tender will, of course, entirely disappear, while the railway coal haulage will be largely curtailed by utilisation of water as a source of power and the establishment of steam power-houses as near coal mines as an abundant supply of good condensing water and load demand will permit. While the water power should be utilised to the fullest economical extent, the greater portion of the railway power must undoubtedly be supplied by coal, due to the unequal geographical distribution of water power available.

Even with coal as a source of power, it may not be fully appreciated just how enormous is the saving made

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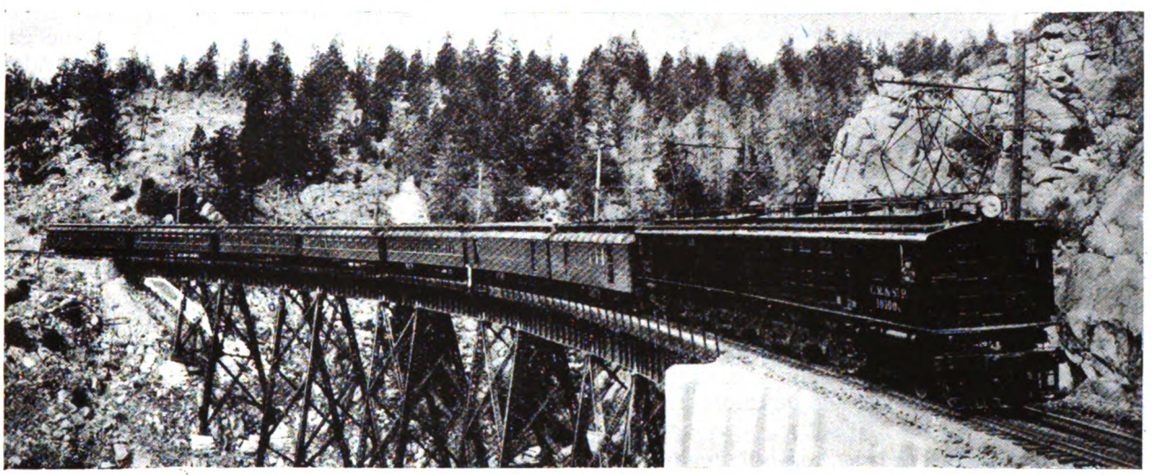
by burning fuel in large modern power-stations under the most efficient conditions possible, instead of under the boilers of 63,000 engines which by necessity must be designed and operated for service rather than for fuel economy. During the year 1918 the fuel used by the railways is reported to be as shown in Table II.

TABLE II.—RAILWAY FUEL, 1918.

Total coal production (all grades)	678,211,000 tons
Used by steam railways	163,000,000 tons
Percentage of total	24 per cent.
Total oil marketed in U.S.	355,927,000 bbl.
Used by steam railways	45,700,000 bbl.
Percentage of total	5·8 per cent.
Coal equivalent of oil at 3½ bbl.	13,000,000 tons
Total equivalent railway coal	176,000,000 tons

A quarter of all the coal mined in the United States is consumed on the railways, and the following analysis will point out some features of this extreme wastefulness which are inseparable from steam engine operation.

During the year 1910 exhaustive tests were made upon the Rocky Mountain Division of the C., M. and St. P. Railway to determine the relation existing between the horse-power hours work done in moving trains and the coal and water consumed on the steam engines in service. Table III. gives the results of these tests—



Electric Locomotive with Express Passenger Train Descending Slope of the Rocky Mountains.

TABLE III.—C., M. AND ST. P. RLY.—ROCKY MOUNTAIN DIVISION. Coal and Water Used.

	Water per H.P. Hour.	Water per Lb. Coal.	Coal per H.P. Hour.
Three Forks-Piedmont	39·6	5·08	7·75
Piedmont-Donald	35·4	4·70	7·54
Deer Lodge-Butte	39·7	4·85	8·31
Butte-Donald	40·4	4·86	8·74
Harlowton-Jenny	38·0	4·09	8·90
Jenny-Summit	44·2	4·65	9·48
Three Forks-Piedmont	41·4	6·51	6·37
Piedmont-Donald	40·2	5·63	5·78
Average of eight tests	39·86	5·04	7·86

The records were obtained during the portion of the runs when engines were doing useful work in overcoming train and grade resistance, that is, all standby losses were excluded. The through run, however, included such losses as are shown in Table IV.—

TABLE IV.—STANDBY LOSSES.

	Coal per Hour.
Fire banked in roundhouse	150 lb.
Cleaning fires for starting	800 lb.
Coasting down grade	950 lb.
Standing on passing track	500 lb.

Adding standby losses to the average of 7·86 lb. per horse-power hour obtained in the preceding eight tests the total actual coal consumed under the engine boiler in twenty-four hours, divided by the actual work performed by the engine, is found to be 10·18 lb. per horse-power hour at the driver rims.

As the result of this particular series of tests it was determined that the coal consumed while doing useful work was raised 30 per cent. by standby losses. It should be appreciated in this connection, moreover, that this value was obtained on through runs with no yard switching service or adverse climatic conditions. It may be concluded therefore that under all conditions of service fully one-third of the coal burned on our steam engines to-day is absolutely wasted in standby losses of the general nature indicated above.

Supplementing these tests, a 30-day record was kept of all the coal used on the entire Rocky Mountain Division and the total engine, tender, and train movement reduced to horse-power hours, resulting in a value of 10·53 lb. coal consumed per horse-power hour at the driver rims. Both of the above values were based upon constants of 6 lb. per ton train resistance at all speeds, and 0·7 lb. per ton per degree of curvature as determined in part by dynamometer car tests and representative of general railway operation. Reducing the average coal values of the test runs and the 30-day record per horse-power hour to electrical constants, we arrive at the data shown in Table V.—

TABLE V.—COAL EQUIVALENT PER KW. HOUR—STEAM OPERATION.

Coal per H.P. hour at driver rims	10·27 lb.
Coal per KW. hour at driver rims	13·75 lb.
Coal per KW. hour at power supply on basis 55 per cent. efficiency	7·56 lb.

It is this last figure of 7·56 lb. of coal burned on steam engines to get the equivalent tonnage movement of one kilowatt-hour delivered from an electric power-station that is of special interest to this discussion. Comparing coal and electrical records on the Butte, Anaconda and Pacific Railway before and after electrification results in arriving at the value of 7·17 lb. of coal previously burned on the steam engines to equal the same service now performed by one kilowatt-hour input at the sub-stations, a figure comparing favourably with 7·56 lb. above arrived at by an entirely different method.

TABLE VI.—ANALYSIS OF ROUNDUP COAL USED.

Fixed carbon	49·26 per cent.
Volatile carbon	38·12 ,,
Ash	7·74 ,,
Moisture	4·88 ,,
B.T.U.	11,899

Making the due allowance for the fact that "round-up" coal is somewhat low in heat units, it is nevertheless within the limits of reasonable accuracy to assume that

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the steam engines operating over all our railways are consuming coal at a rate closely approximating 12·75 lb. per kilowatt-hour of useful work done, as measured at the driver rims, or 7 lb. per kilowatt-hour as measured at a power-station, and including for convenience of comparison the transmission and conversion losses inherent to electrical operation.

An electric kilowatt can be produced for so much less than 7 lb. of coal that we are now in a position finally to forecast the approximate extent of the coal economy that would result from electrification.

TABLE VII.—RELATION BETWEEN KW. HOUR AND TON-MILES CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY. Avery-Harlowton, Year 1918.

	Passenger.	Freight.
Average weight locomotive	300 ton	284 ton
Locomotive miles, 1918	651,000	1,431,500
Locomotive ton-miles	195,000,000	407,000,000
Trailing ton-miles	434,406,000	2,903,099,000
Total ton-miles	629,406,000	3,310,049,000
Kilowatt-hours	24,890,000	105,287,000
Watt-hours per ton-mile	39·6	31·9
Ratio locomotive to total	31 per cent.	12·3 per cent.
Watt-hours per ton-mile combined movement		33·2
Ratio locomotive to total combined movement...		15·25 per cent.

All power values in Table VII. are given at the point of supply from the Montana Power Company at 100,000 volts, and include deductions made for the return of power due to regenerative braking of the electric locomotives on down grades, amounting to approximately 14 per cent. of the total. Owing to the excessive rise and fall of the profile of the electrified zone of the C., M. and St. P. Railway, its operation is materially benefited by regenerative electric braking, and the value of 33·2 watt-hours per ton-mile for combined and passenger movement should possibly be raised to the round figure of 40 to make it apply more nearly to conditions universally obtaining on more regular profiles.

Hence, referring again to the ton-mile values of Table I.—

Total ton-miles, 1918	1,215,400,000,000
Watt-hours ton-mile	40
KW. hour total movement	48,700,000,000
Coal required at 7 lb. per KW. hour	170,000,000 ton

The actual equivalent coal consumed on our steam railways for the year 1918 is given as 176,000,000 tons, closely approximating the figure of 170,000,000 tons estimated above from the operating results obtained on the C., M. and St. P. electrified zone. These several values check so closely as to justify the completion of the fuel analysis of the railways as shown in Table VIII.—

TABLE VIII.—COAL SAVING BY ELECTRIFICATION.

Total ton-miles steam	1,215,400,000,000
Reduction by electrification	146,000,000,000
Total ton-miles electric	1,069,400,000,000
KW. hour electric at 40 watts	42,776,000,000
Coal on basis 2½ lb. per KW. hour	53,500,000 tons
Equivalent railway coal, 1918	176,000,000 tons
Saving by electrification	122,500,000 tons

The startling conclusion arrived at is that approximately 122,500,000 tons of coal, or more than two-thirds the coal now burned in our 63,000 steam engines, would have been saved during the year 1918 had the railways of the United States been completely electrified along lines fully tested and proved successful to-day. This vast amount of coal is 50 per cent. greater than the pre-war exports of England, and twice the total amount consumed in France for all its railways and industries. Moreover, the estimate is probably too conservative as no allowance has been made for the extensive utilisation of water power, which can be developed to produce power more cheaply than by coal in many favoured localities.

Perhaps no nation can be justly criticised for lavishly using the natural resources with which it may be abundantly provided. In striking contrast with the picture of fuel waste on the railways in this country, however, is the situation presented in Europe at this writing.

Faced with a staggering war debt, with two millions of its best men gone and an undetermined number incapacitated for hard labour, and with so much reconstruction work to do, France has to contend also with the destruction of half its coal producing capacity. Before the war France imported twenty-three million of the sixty-five million tons of coal consumed. It is estimated that the full restoration of coal mines in the Lens region will take ten years to accomplish, which means materially increasing the coal imported into France if pre-war consumption is to be reached, as the relief rendered from the Saar district will not compensate for the loss on productivity of the mines destroyed by the Germans. This situation is being promptly met in part by France in the appointment of a Commission to study the feasibility of the general electrification of all its railways, with special reference to immediate construction in districts adjacent to its three large water-power groups, the Alps, the Pyrenees, and the Dordoyne or Central Plateau region. It is proposed to electrify 5,200 miles of its total of 26,000 miles of railways during a period covering twenty years. If this work is accomplished at a uniform rate of 260 miles a year, it is a most modest programme considering the extreme necessity for the improvement.

In even worse plight is Italy, with practically no coal of its own and compelled to import its total supply of 9,000,000 tons. The war has brought home to these countries what it means to be dependent upon imported fuel for their very existence, and both Italy and Switzerland are also proceeding with extensive plans for railway electrification. Contrary to the general understanding, the mines of Belgium are not destroyed, but the need of fuel economy is very acute, and this country also has broad plans for railway electrification with immediate construction in view.

Recognising the many advantages of electric operation of its railways, Europe furthermore considers this a most opportune time to start the change, rather than to spend its limited funds in replacing worn out and obsolete steam equipment in kind. Also in marked contrast to the American attitude is the sympathetic interest and constructive assistance rendered by the Governments abroad in regard to the vital matter of rehabilitation of its railway systems. It would not be without precedent if the next decade witnessed England and the Continent outstripping this country in the exploitation of another industry which, while possibly not conceived here, has certainly been more fully developed and perfected in America than elsewhere.

From figures given the conclusions in Table IX. are arrived at in the matter of power-station capacity required for complete electrification of the railways in the United States.

TABLE IX.—RAILWAY POWER REQUIRED.

KW. hour electric operation, 1918 ...	42,776,000,000 KW. hour
Average load, 100 per cent. load-factor ...	4,875,000 KW.
Power-station capacity at 50 per cent. load-factor	9,750,000 KW.

It appears therefore that approximately 10,000,000 KW. power-station capacity would have been sufficient to run all the railroads for the year 1918, or one-half the station capacity which has been constructed during the past thirty years.

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TABLE X.—ESTIMATED POWER-STATION CAPACITY, UNITED STATES, YEAR 1918.

Central stations	9,000,000 KW.
Electric railways	3,000,000 KW.
Isolated plants	8,000,000 KW.
Total	20,000,000 KW.

In the order of magnitude therefore it is not such a formidable problem to consider the matter of power supply for our electrified railways, and it becomes evident also that the railway power demand will be secondary to industrial and miscellaneous requirements.

Such being the case, the question of frequency of electric power supply becomes of great importance, if the full benefit is to be obtained from extensive interconnected generating and transmission systems covering the entire country. Indeed, with the full development of interconnected power systems supplying both railway and industrial load from the same transmission wires, the above assumption of 50 per cent. load-factor for the railway load can be materially bettered.

In this connection a method of limiting the troublesome peak load hitherto considered inherent to railway power-supply has been in successful operation on the electrified C., M. and St. P. zone for the past year. With unrestrained peaks, the load-factor was approximately 40 per cent., but this low value has been raised to nearly 60 per cent. by the installation of an inexpensive and most satisfactory device known as the power limiting and indicating apparatus.

TABLE XI.—LOAD-FACTOR RECORDS, C., M. AND ST. P. RAILWAY, 1919.

	Per cent. Duration of Peak.	Per cent. Load-Factor.
April	6·4	59·3
May	4·6	56·1
June	1·6	56·5
July	0·7	55·6
August	9·5	58·8
September	4·1	54·7

The readings in Table XI. cover the performance on the 220 miles of the Rocky Mountain Division supplied by seven sub-stations controlled as a unit. A load-factor of nearly 60 per cent. brings the electric railway within the list of desirable customers, and makes it possible for power companies to quote attractively low rates for power.

Returning again to the question of power supply, it is instructive to note the general trend toward a higher frequency, as evidenced by the turbine and transformer sales of the General Electric Company during the past decade.

It is quite evident that 60 cycles is rapidly becoming the standard frequency in America, and many instances are on record where it has replaced lower frequencies, principally 25 cycles. This fact in no manner handicaps the future development of electric railways, as entirely satisfactory power can be obtained from 60-cycle transmission lines through rotary converters or synchronous motor generator sets, depending upon the direct-current trolley voltage desired. Indeed a growing appreciation of the declining importance of 25-cycle power generation in this country contributed largely to the demise of the single-phase system, as its chief claim for recognition is wiped out with the introduction of the motor generator sub-stations required with 60-cycle supply.

While America apparently has adopted 60 cycles as its standard frequency, and can look forward to unlimited interconnection of its large power systems, European practice is evidently crystallising on 50 cycles. The situation abroad is as yet, however, not clearly defined. In such a small, compact country as Switzerland, for instance, where so much electrical development is taking place, there is much conflict of frequencies. Apparently there is little appreciation of the advantages resulting from interconnected power-stations; in fact the Loetschberg Railway is supplied with power from 15-cycle waterwheel-driven generators placed in the same power-station with 42-cycle units supplying industrial load while in the same immediate district there is a 50-cycle transmission line and no tie-in frequency changer sets as yet installed to interconnect any two frequencies. The power company, power consumer, and electrical manufacturer pay heavily for the complication imposed by maintaining three frequencies where only one is needed, and growing appreciation of this fact may lead to the standardisation of 50 cycles in Switzerland, and thus swing that country in line with its neighbours and ultimately bring about a more economical ratio of installed generator capacity to average load demand for the country as a whole.

A good example of the necessity for improvement in power distribution conditions in Switzerland is provided in the supply of power to the Loetschberg Railway as illustrated in Table XII.

TABLE XII.—POWER SUPPLY TO THE LOETSCHBERG RAILWAY, March, 1919.

Total for month	540,180 KW. hour
Average of six 15-min. peaks	3,489 KW.
Load-factor, basis 24 hours	20·8 per cent.

As the railway was operating for only seventeen hours per day, the load-factor during actual operation is something better than 20·8 per cent. On the other hand, the actual momentary peak load greatly exceeded 3,489 KW.; and this very fluctuating railway load furnishes a good illustration of the need of combining it with other diversified loads, in order to keep down the fixed investment of power-station equipment now set aside for this isolated railway load. For example, the 60 per cent. load-factor of the C., M. and St. P. power demand is the ratio of average to momentary peak, while the Loetschberg Railway peak load is determined by six 15-min. peaks with momentary peaks greatly in excess of this figure.

Apparently the adoption of a standard frequency of 50 cycles would meet all general requirements in Switzerland, but would necessitate the installation of frequency-changing sub-stations to meet the demands for 15-cycle, single-phase railway power. If the electrified railways are to be benefited therefore from the establishment of a common generating and transmission system in Switzerland, the choice of the single-phase railway system might possibly be considered unfortunate, viewed in the light of modern development in power economics and the successful adaptation of the less expensive and more flexible direct-current motor to high trolley voltages.

From the power-station standpoint, the electrification of our railways admits but one conclusion. We have some 63,000 engines now in operation, and their average combined load amounts to approximately four million horse-power at the driver rims, or only an insignificant total of 65 H.P. for each engine owned. It is true that, owing to shopping and to one cause or another, a large proportion of these engines are not in active service at all times, still the average twenty-four hour output of each engine is less than 10 per cent. of its rating. In the case of the C., M. and St. P. electrification the average load of each individual electric locomotive is only 15 per cent. of its continuous rating, but by supplying power to 45 electric locomotives from one transmission system, the average combined load-factor is raised to nearly 60 per cent.,

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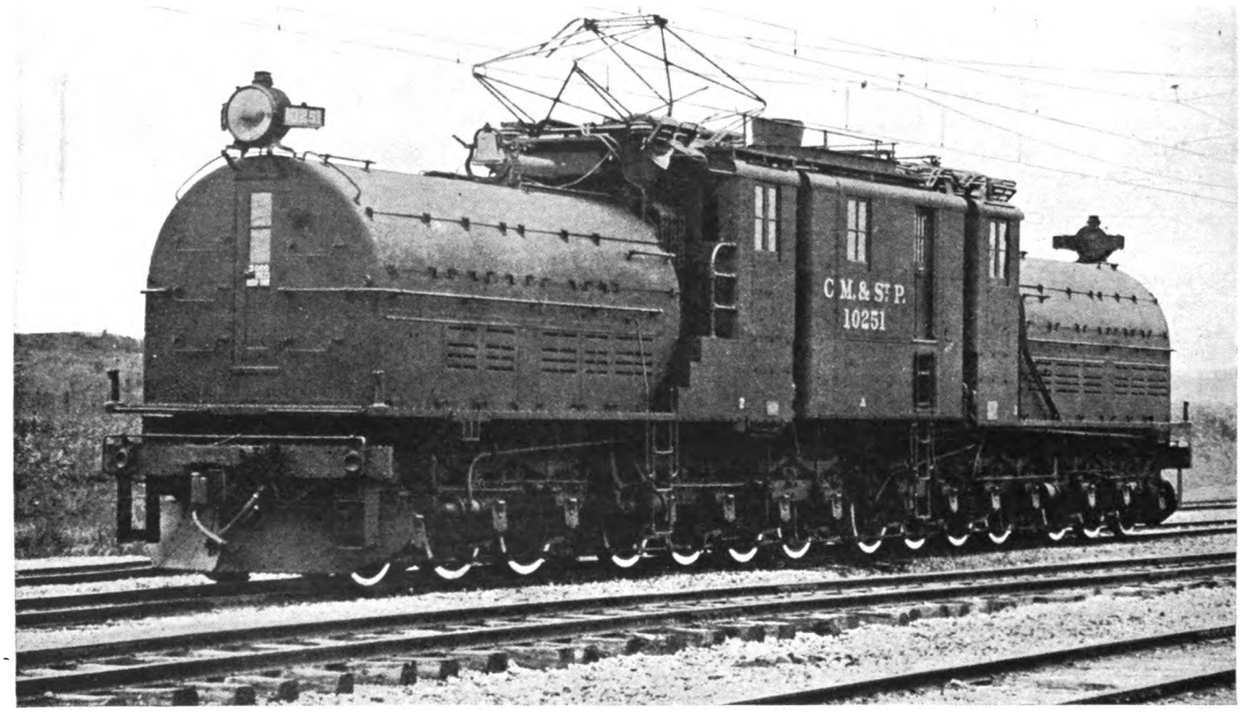
a figure which could even be surpassed on roads of more regular profile. Furthermore, when the railway load is merged with the lighting and industrial power of the district, and the whole diversified load supplied from the same 60-cycle transmission and generating system, it is quite evident that all conditions are most favourable for the efficient production of power. In this country such an achievement will probably be governed by the laws of economic return upon the capital required because our vast natural fuel resources are properly regarded as inexhaustible, but in Europe there is the compelling spur of stern necessity behind the movement to utilise economically the water powers they possess in place of the coal they cannot get.

While the much discussed subject of power generation and transmission is a very vital part of the railway electrification project, chief interest centres in the electric locomotive itself. Few realise what a truly wonderful development has taken place in this connection in a comparatively few years, and how peculiarly fitted this type of motive power is to meet the requirements of rail transportation. Free from the limitations of the steam boiler, and possessing in the electric motor the most efficient and flexible known means of transmitting power to the driving axles, the electric locomotive gives promise of revolutionising present steam railway practice when its capabilities become fully recognised. The only limits placed upon the speed and hauling capacity of a single locomotive are those imposed by track alignment and standard draft rigging. Only questions of cost and expediency control the size of the locomotive that can be built and operated by one man, as there are no mechanical or electric limitations that have not been brushed aside by careful development. Just what this means in advancing the art of railroading is as yet but faintly grasped, no more than the boldest prophet of twenty years ago could have fully pictured the change that has taken place at the Grand Central Station in New York as the result of replacing steam by electricity.

Progress in utilising the capabilities of the electric locomotive have been slow. It is hard to break away from life-long railway traditions established by costly experience in many cases. In consequence the electric locomotive has thus far simply replaced the steam engine in nearly similar operation. Even under such conditions of only partial fulfilment of its possibilities the electric locomotive has scored such a signal operating success as to justify giving it the fullest consideration in future railway improvement plans.

On the C., M. and St. P. Railway 42 electric locomotives have replaced 112 steam engines and are hauling a greater tonnage with reserve capacity for still more. On this and other roads electrification has set a new standard for reliability and low cost of operation. In fact, although no official figures have yet been published, it is an open secret that the reductions in steam operating expenses on the C., M. and St. P. Railway are sufficient to show an attractive return upon the twelve and a half million dollars expended for the 440 miles of electrification, without deducting the value of the 112 steam engines released for service elsewhere. As the electric locomotive is destined to leave its deep impression upon the development history of our railways, it is fitting that the remainder of this paper should be devoted to its consideration.



A 3,000-volt Direct-Current Gearless Electric Locomotive.

Our steam engine construction is unsymmetrical in wheel arrangement, must run single-ended, and is further handicapped with the addition of a tender to carry its fuel and water supply. The result has been much congestion at terminals; and the necessary roundhouses, always with the inevitable turntables, ash-pits, and coal and water facilities, have occupied

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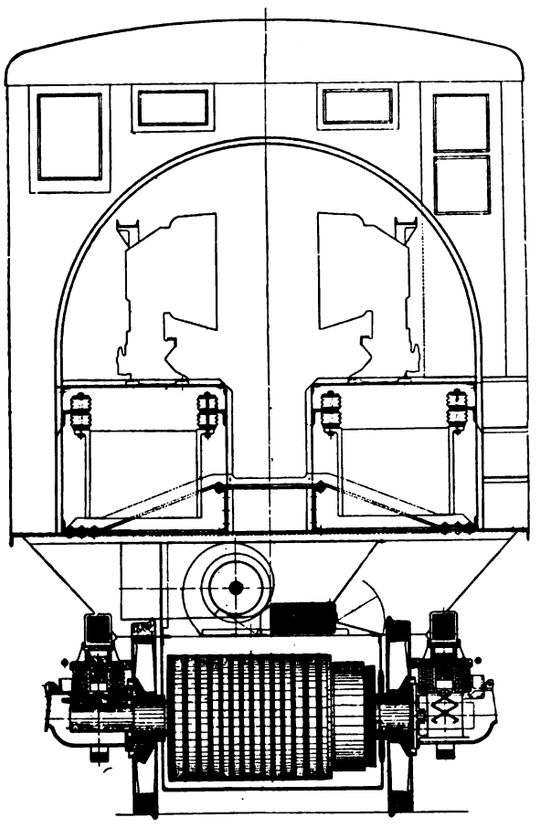
much valuable land ; and in addition steam operation has greatly depreciated the value of neighbouring real estate.

While it has been a simple matter to design electric locomotives to run double-ended at the moderate speed required in freight service, the problem of higher speed attainment, exceeding 60 miles per hour, has presented greater difficulties. The electric motor is, however, so adaptable to the needs of running gear design that electric locomotives are now in operation which can meet all requirements of high-speed passenger train running. These results also are obtained with less than 40,000 lb. total weight, and 9,500 lb. non-spring



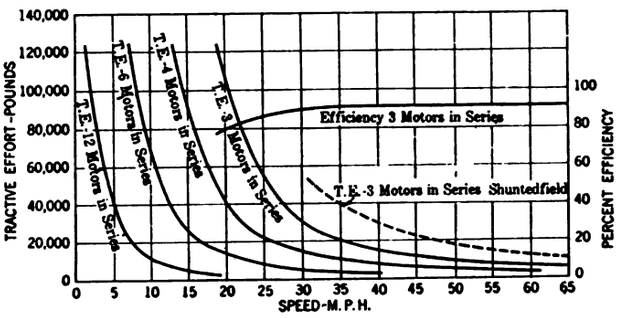
End Elevation of Gearless Motor Electric Locomotive—C., M. and St. P. Railway.

borne or "dead" weight on each driving axle, and finally, but not least, with both front and rear trucks riding equally well, a success never before achieved in locomotives of such large capacity.

In connection with the riding qualities of electric locomotives, it is of interest to note the conclusions that the committee of the American Railway Engineering Association (F. E. Turneaure, chairman) reached in their report of 1917—

From the results of the tests on the electrified section of the Chicago, Milwaukee and St. Paul Railway, the tests made in 1916 on the Norfolk and Western, and the few tests made in 1909 at Schenectady, New York, it would appear to be fairly well established that the impact effect from electric locomotives is very much less than from steam locomotives of the usual type. Comparing results obtained in these tests with the results from steam locomotives, it would appear that the impact from electric locomotives on structures exceeding, say, 25 ft. span length, is not more than one-third of the impact produced by steam locomotives.

There is as yet no general acceptance of a standard design of electric locomotive. Geared side-rod construction for heavy freight service and twin motors geared to a quill for passenger locomotives appear to find favour with the Westinghouse-Baldwin engineers, while the General Electric Company goes in for the simple arrangement of geared axle motor for freight and gearless motors for passenger locomotives. In both Switzerland and Italy the side-rod locomotive enjoys an almost exclusive field. How much of this preference for side-rod construction is due to the restrictions imposed by the use of alternating current motors is hard to determine, but the facts available

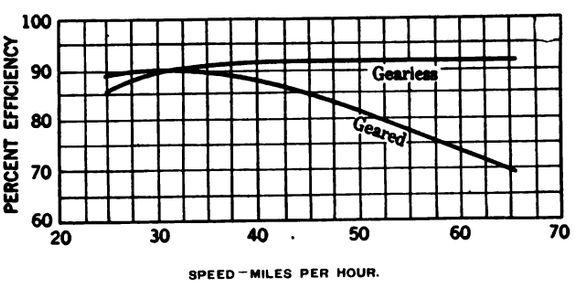


Characteristic Curve 3,000-volt D.C. Gearless Motor Locomotive.

indicate both in this country and abroad the uniformly higher cost of repairs of this more complicated form of mechanical drive.

The electric railway situation in Italy is further complicated by the employment of three-phase induction motors with all the attendant handicaps of double overhead trolleys, low power factor, constant speeds, and overheating of motors resulting from operation on ruling gradients in cascade connection. In many respects the non-flexible three-phase induction motor is poorly adapted to meet the varied requirements of universal electrification, and in consequence Italian engineers are still struggling with the vexing question of a system, which may, however, be in a fair way of settlement through the adoption of a standard of 50 cycles as the frequency of a nation-wide interconnected power supply, thus throwing the preponderance of advantages to high-voltage direct current.

The extreme simplicity of the gearless motor locomotive appeals to many, as does its enviable record of low maintenance cost, reliability, and high operating efficiency, as exemplified by its unvarying performance



Efficiency Curves of Geared and Gearless C., M. and St. P. Railway Locomotives.

in the electrified zone of the New York Central Railway for the past twelve years. Table XIII. shows that the high cost of living did not appear to have reached this favoured type of locomotive until the year 1918.

TABLE XIII.—MAINTENANCE COSTS, NEW YORK CENTRAL.

	1913	1914	1915	1916	1917	1918
Number locomotives owned ...	48	62	63	63	73	73
Average weight, tons	118	118	118	118	118	118
Cost of repairs per locomotive mile cents	4·32	4·03	4·45	3·78	4·01	6·26

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The records on the C., M. and St. P. locomotive are equally remarkable when considering their greater weight and the more severe character of service.

TABLE XIV.—LOCOMOTIVE MAINTENANCE COSTS, CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY.

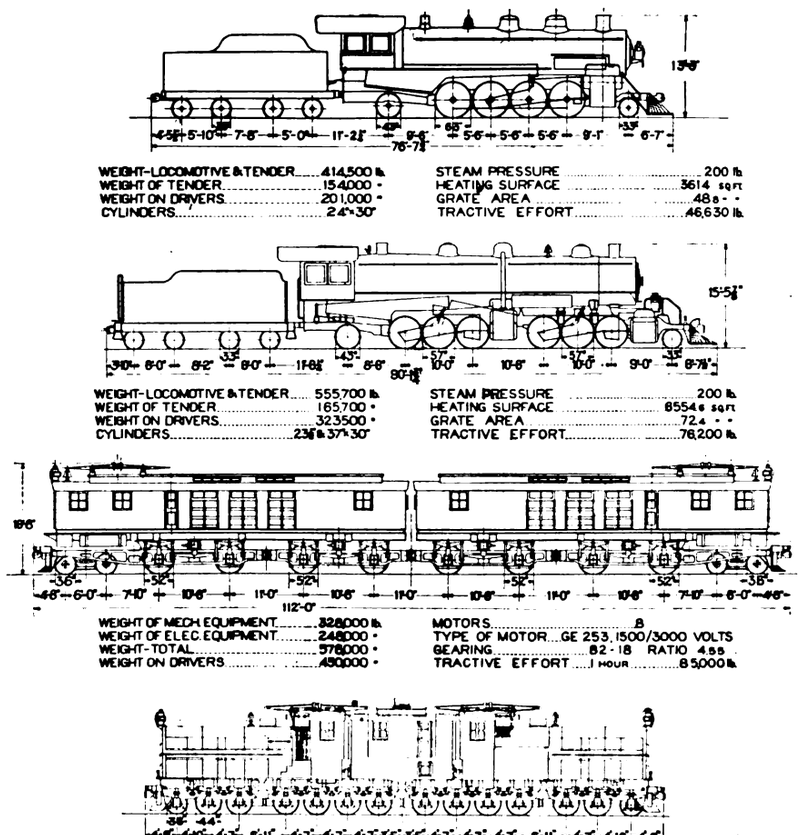
	1916	1917	1918
Number locomotives owned	20	44	45
Average weight, tons	290	290	290
Cost repairs per locomotive mile... ...	8·21	9·62	10·87

In both these instances the cost of repairs approaches closely to three cents per 100 tons of locomotive weight. Giving due credit to the excellent repair shop service rendered in each case, it is instructive to note that three cents per 100 tons maintenance cost of these direct-current locomotives is less than half the figures given for any of the alternating-current locomotives operating in the United States or in Europe.

Compared with the cost of repairs for equivalent steam engines, the above figures for electric locomotives are so very favourable as to justify the general statement that electric motive power can be maintained for approximately one-third of the cost of that of steam engines for the same train tonnage handled. As locomotive maintenance is a measure of reliability in service, and in a way expresses the number of engine failures, it is quite in keeping with the records available to state also that the electric locomotive has introduced a new standard of reliability that effects material savings in engine and train crew expense as well.

While the first cost of electrification is admittedly high, it may in certain instances be the cheapest way to increase the tonnage carrying capacity of a single track, especially in mountain districts, where construction is most expensive and steam engine operation is most severely handicapped. In this connection a comparison of steam and electric operation on the C., M. and St. P. Railway may be summarised as follows—For the same freight tonnage handled over the Rocky Mountain Division, electric operation has effected a reduction of 22½ per cent. in the number of trains, 24·5 per cent. in the average time per train, and has improved the operating conditions so that nearly 30 per cent. more tonnage can be handled by electric operation in about 80 per cent. of the time it formerly took to handle the lesser tonnage by steam engines. This means a material increase in capacity of this single-track line which may be conservatively estimated in the order of at least 50 per cent. and probably more. In other words, on this particular road electrification has effected economies which sufficiently justify the capital expenditure incurred, and furthermore has postponed for an indefinite period any necessity for constructing a second track through this difficult mountainous country.

A careful study of the seriously congested tracks of the Baltimore and Ohio Railroad between Grafton and Cumberland disclosed vitally interesting facts. Company coal movement in coal cars and engine tenders constituted over 11 per cent. of the total ton-miles passing over the tracks. In other words, due to the very broken profile of this division, the equivalent of one train in every nine is required to haul the coal burned on the engines. Taking advantage of this fact, and the higher speed and hauling capacity of the electric locomotive and its freedom from delays due to taking on water and fuel, it is estimated that the three tracks now badly congested with present steam engine tonnage could carry 80 per cent. more freight with electric locomotive operation. The coal output of the Fairmount District is largely restricted by the congestion of this division of the B. and O.R.R., and it is probable that equal relief with continued steam engine operation could not be secured without the expenditure of a much larger sum for additional track facilities than would be needed to put electric locomotives upon the present tracks.


WEIGHT-LOCOMOTIVE & TENDER 414,500 lb.
WEIGHT OF TENDER 154,000 "
WEIGHT ON DRIVERS 201,000 "
CYLINDERS 24"×30"
STEAM PRESSURE 200 lb.
HEATING SURFACE 3614 sq ft
GRATE AREA 48·8 "
TRACTIVE EFFORT 46,630 lb.
WEIGHT-LOCOMOTIVE & TENDER 555700 lb.
WEIGHT OF TENDER 165700 "
WEIGHT ON DRIVERS 323500 "
CYLINDERS 23½ & 37"×30"
STEAM PRESSURE 200 lb.
HEATING SURFACE 8554·6 sq ft
GRATE AREA 72·4 "
TRACTIVE EFFORT 76,200 lb.
WEIGHT OF MECH. EQUIPMENT 328000 lb.
WEIGHT OF ELEC. EQUIPMENT 248000 "
WEIGHT-TOTAL 576000 "
WEIGHT ON DRIVERS 490000 "
MOTORS 8
TYPE OF MOTOR GE 253, 1500/3000 VOLTS
GEARING 62-18 RATIO 4.55
TRACTIVE EFFORT 1 HOUR 85,000 lb.
WEIGHT OF MECH. EQUIPMENT 295000 lb.
WEIGHT OF ELEC. EQUIPMENT 235,000 "
WEIGHT-TOTAL 530000 "
WEIGHT ON DRIVERS 458,000 "
MOTORS 12
TYPE OF MOTOR GE 100, 1000/3000 VOLTS
GEARING GEARLESS
TRACTIVE EFFORT 1 HOUR 48,000 lb.

Principal Types of Steam and Electric Locomotives on the Chicago, Milwaukee, and St. Paul Railway.

Further instances could be cited where the benefits of electrification are badly needed, and many of these are coal-carrying roads, among which the Virginian Railway stands out conspicuously as a good opportunity to make both a necessary improvement and a sound investment.

Reviewing the progress made in a short twenty-year period, we have seen the steam turbine and electric generator drive the reciprocating engine from the stationary power field. The same replacement is now taking place on our ships, big and small, notwithstanding the fact that the marine reciprocating engine is a very good engine indeed, and operates under ideal conditions of steady load and constant speed. And now the steam locomotive must in turn give way to

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the electric motor for the same good reason that the reciprocating steam locomotive has become obsolete and fails to respond to our advancing needs. Electrification affords a cheaper and better means of securing increased track capacity and improved service than by laying more rails and continuing the operation of still more steam engines in the same old wasteful way.

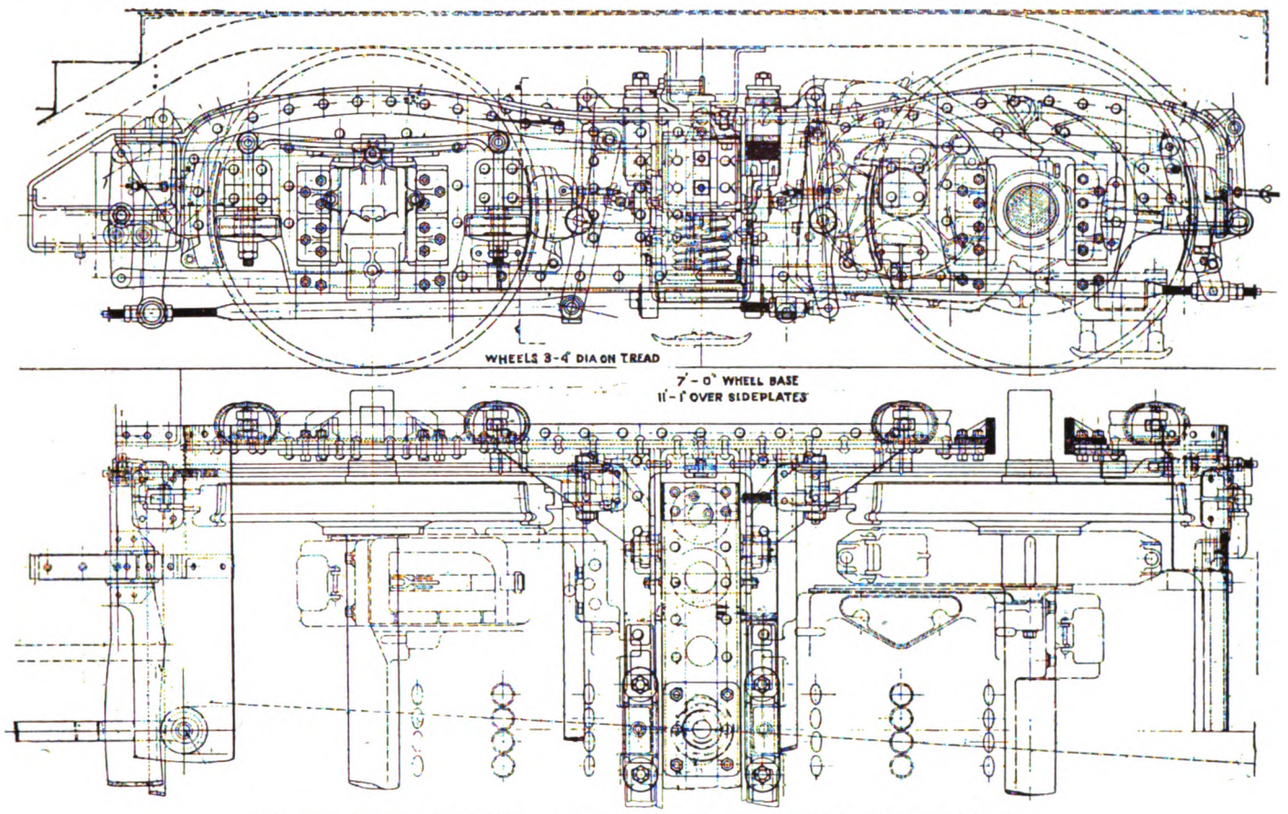
To conclude the startling picture of our present railway inefficiency, we are to-day wasting enough fuel on our steam engines to pay interest charges on the cost of completely electrifying all the railways in the United States, fuel that Europe stands in sad need of, and which England and Germany, the pre-war coal exporting countries, cannot now supply. With operating expenses mounting to 82 per cent. of revenue, inadequate equipment, and congestion of tracks, what we need, in addition to constructive legislation and real co-operation on the part of the Government in the matter of rates and safeguarding invested capital, is wise direction in the expenditure of the large sums that must speedily be found and used to bring our railways abreast of the times. Accord full honour to the reciprocating steam engine for the great part it has played in the development of our railways and industries, but complete the work by replacing it with the electric motor and enter upon a new era of real railroading, not restricted steam engine railroading.

Paulista Railway Electrification.—The Westinghouse Electric International Company has obtained contracts for four electric locomotives—two for passenger service and two for freight service—for the Paulista Railway (Brazil). This electrification will initially include 28 miles of route, but it is expected that extensions will be made, bringing the line electrified to 100 miles. The Westinghouse passenger locomotives will have a one-hour rating of 2,000 H.P., and weigh 121 tons. They will be operated from a 3,000 volt, D.C. overhead trolley system, and will be complete with regenerative control. They are designed for a maximum speed of 65 miles per hour, and have a track gauge of 5 ft. 3 in. The freight locomotives have a one-hour rating of 1,500 H.P., and will weigh 87 tons. The maximum speed will be 40 miles per hour, and the gauge 5 ft. 3 in.

THE NEW ROLLING STOCK FOR BAKERLOO AND WATFORD SERVICE.

In our issue of April 15 was published an illustrated account of the new joint stock built for the London and North-Western and London Electric Railway Companies. The photographs then given are now supplemented by drawings of the cars, for which we are indebted to Mr. Agnew. These drawings are very complete in detail, and are of much interest to everyone concerned in electric rolling stock.

It may be recalled that the new trains are providing the through service between the Baker Street and Waterloo Railway and the electric lines of the London and North-Western to Watford, the total route length being about 21 miles. The junction of the two companies' systems is at Queen's Park, Willesden. It may now be pointed out that from the aspect of time the new cars have come into service opportunely. About the beginning of the war new rolling stock was delivered for use on the extension of the Central London Railway from Wood Lane, Shepherds Bush, to Ealing, a distance of over four miles. The extension railway was, however, not finished, and its completion was delayed by the war. Even after the tracks were finished their electrical equipment was delayed, but now everything is nearly complete, and it is expected that very shortly electric trains will be running between Ealing (Great Western Railway) and Liverpool Street in the City of London, a distance of about 11 miles. This will give a third route between the City and Ealing, the other two being the Metropolitan District Railway and the Great Western and Metropolitan Railways *via* the northern part of the Inner Circle. The delivery of the new trains for the Bakerloo and Watford service thus conveniently frees the Central London and Great Western electric rolling stock for its original purpose.



Side Elevation and Half-Plan of Motor Truck—New Bakerloo Rolling Stock.

The Bakerloo and North Western cars, of which drawings are here shown, are of all-steel construction

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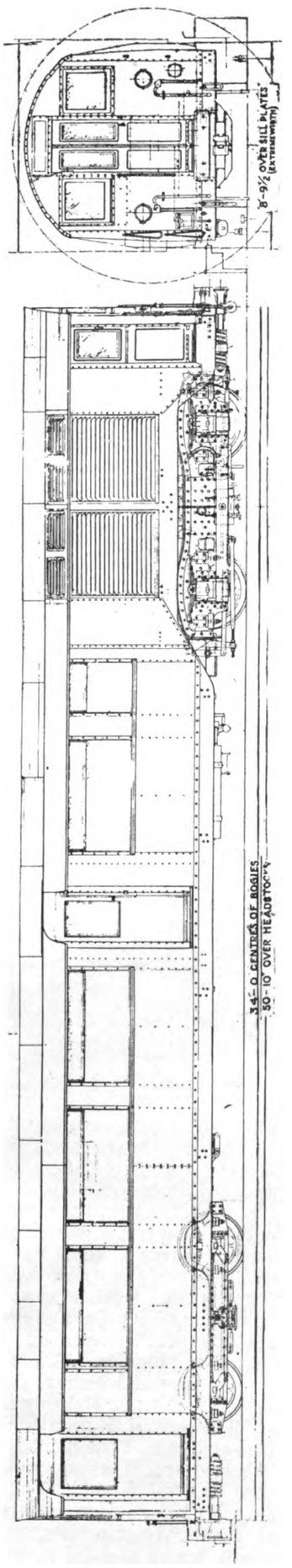
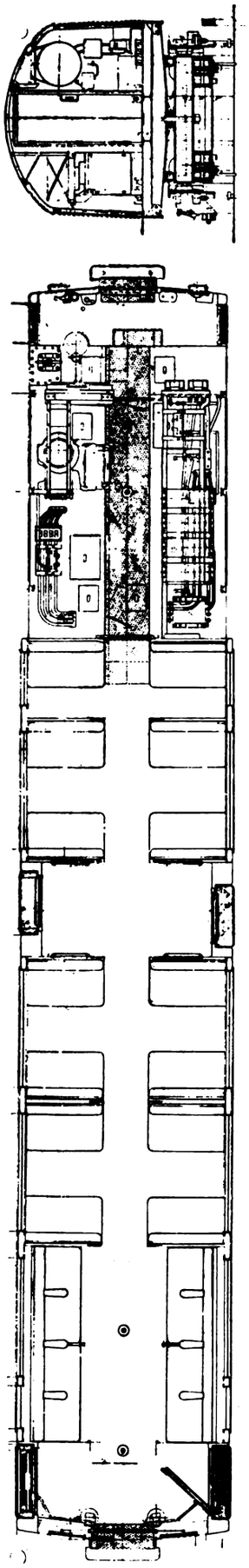
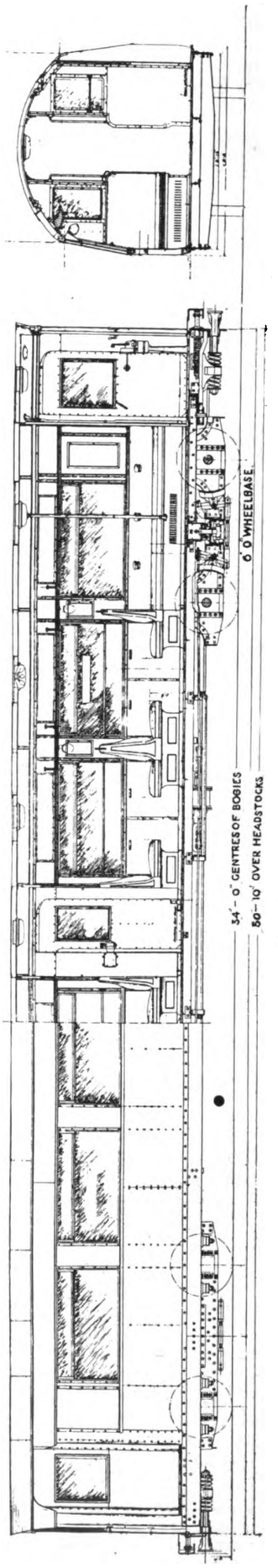




Elevation, Plan and Sections of Motor Car.



Elevation and Sections of Trailer Car.

New Rolling Stock for Bakerloo and Watford Service.

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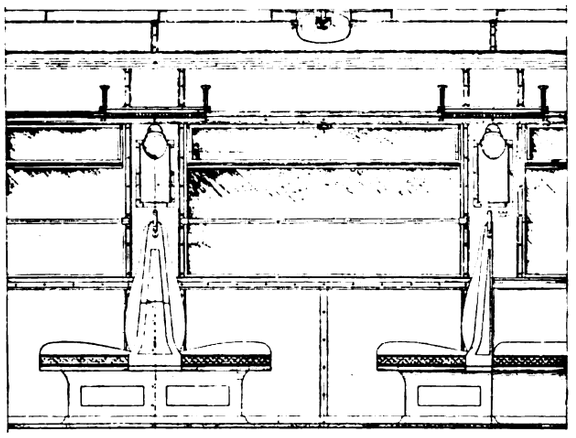
and very handsomely finished. The total weight of the six-car train is 161 tons, and the length overall of each car is 50 ft. 10 in. Each train consists of three motor cars and three trailers, and each motor car has two 240 H.P. British Thomson-Houston motors. The



Inside Elevation of Bakerloo Railway Car.

seating capacity per train is 252. Very satisfactory results are being obtained in the running of the new trains, which were built by the Metropolitan Carriage Wagon and Finance Company.

ELECTRIC WELDING IN BUILDING CONSTRUCTION.

At the invitation of Alloy Welding Processes, Limited, of 16, Cockspur Street, S.W.1., a representative of this journal recently had an opportunity of inspecting the building constructional work which is now in progress at Effra Road, Brixton, London. The actual work is being carried out by the Welding Construction Company, which has been formed for the special purpose of handling contracts of this kind as distinct from the many other fields in which the parent company is interested. The building in Effra Road is being constructed for the manufacture of the "Stelfast" wheel, an all-steel, electrically-welded wheel, which will be constructed by the "A. W. P." system, and turned out in large quantities. The erection of this building affords an excellent opportunity for demonstrating the advantages of electric welding in building construction. By this system the use of rivets or bolts is dispensed with entirely. All the necessary girders, angles, plates, etc., are assembled upon the ground, and then cut into the required lengths. Meantime jigs for shaping the trusses are prepared, and the various sections are then welded together and the complete truss formed. When compared with the old method of construction, drilling holes and riveting, the rapidity of the A. W. P. system is remarkable. The use of jigs for shaping and holding in position the parts to be welded not only leads to rapid production, but also insures absolute accuracy as regards dimension, a most important factor when rapid construction is so desired. In the same manner the stanchions are made with welded sole plates and fitments, and afterwards tied in position by the same method. The trusses are then mounted and welded to their supports.

The Welding Construction Company have constructed and erected a steel building to be used as stabling in connection with the Horse Show at Olympia. This building covers an area of over 9,000 sq. ft., and is 14 ft. high to the top of the trusses. Some idea of the rapidity with which this class of constructional work can be carried out by the A. W. P. welding process will be gathered from the fact that although the order was not placed with the company until April 27, the whole of the work complete for erection was to be delivered at Olympia on May 5. From the experience gained in carrying out this contract, together with the work in connection with the building at Effra Road, the Welding Construction Company are in a position to contract for the construction and erection of steel structures at a cost of about £10 per ton plus the cost of materials, thus showing a saving of from 40 per cent. to 50 per cent. when compared with the riveted or bolted form of construction.

GLASGOW FARE INCREASES.

The General Manager's Instructions to the Staff.

In connection with the alteration in fares which came into operation on the Glasgow Corporation Tramways on June 1, Mr. J. Dalrymple, the general manager, issued a circular to the traffic staff on May 20. It explained the changes, and indicated the procedure to be followed. The general manager stated—It is now eighteen years since any alteration was made in fares, and the staff of the department and the travelling public have become so used to the present scale that they will find some little difficulty in adjusting themselves to the new conditions. Fortunately the change does not affect the position of the various fare stations, and, with a little care and guidance on the part of the traffic staff, the public will soon fall into line with the new arrangement. Briefly put, the alteration means an increase of ½d. on the present fares—that is to say, what is at present a ½d. journey will, from June 1, cost 1d. The present 1d. will cost 1½d., and so on. This means the entire abolition of the ½d. fare, both for adults and juveniles. To minimise the increase for the present ½d. passenger, there will be on sale discount tokens at the rate of twelve for 9d. These tokens will be available to carry a passenger for two stages only—that is to say, for the present ½d. journey. Tokens are not to be accepted for any journeys longer than two stages, and they are not to be accepted as part payment for a longer journey. The token is to be used by adults for a two-stage journey only.

A special token ticket will be issued to conductors, and will be punched like an ordinary ticket and handed as a voucher for each token received from a passenger. The number of tokens in a conductor's bag must correspond with the number of "token tickets" issued by him. A passenger not in possession of a token must pay 1d. for two stages, and the conductor must issue him a 1d. ticket. A token may, however, be used by a juvenile, that is, a person between 5 and 15 years of age, to cover the same distance as is given to an adult for 1½d. In this case the token ticket will be punched in advance, as is done at present in the case of juvenile fares. Otherwise the basis for children's fares will be as at present, namely, half the ordinary adult fares, with a minimum cash fare of 1d.

Conductors must not sell tokens to the public nor give tokens as part change. It has been found impossible to get a sufficient supply of tokens in celluloid, fibre, or metal in time for June 1, and it will be necessary to start with paper checks. These will, however, be replaced as early as possible by tokens of more substantial material which will be more easily handled.

The colour scheme for tickets which is at present in operation will be adhered to as closely as possible. The token ticket will be blue in colour, the same as the present ½d. ticket. White will be retained for the 1d. ticket. The 1½d. ticket will be of a slate colour, as green is not easily procurable, and the other values of tickets will be the same colours as are now in use. The department requires to carry big stocks of all classes of tickets, and it is not possible to make the change-over to the new system in one day. It is intended to use up the existing tickets and waybills, and to introduce the new tickets as soon as the present stocks are exhausted. There will be, of course, a special token ticket issued to every conductor for June 1, but for the other fares the conductor will use the present tickets, charging ½d. more than the amount printed on the ticket—that is to say, a passenger paying 1d. in cash will receive one of the present ½d. tickets; for a 1½d. fare the conductor will issue a 1d. ticket; for a 2d. fare, a 1½d. ticket, and so on.

There is one other point, namely, the question of workmen's fares. By the Glasgow Corporation (Tramways Consolidation) Order of 1905, the department is bound to grant certain concessions to artisans, mechanics, and daily labourers at certain times during the day. To comply with the terms of this Order, any "artisan, mechanic, or daily labourer" boarding any car before 7 a.m., or in the evening between 6 and 6.30 o'clock, will be carried one stage further than an ordinary passenger. The effect is that the "artisan, mechanic, or daily labourer" gets his ticket punched one stage in advance of the ordinary passenger, but the privilege is to be confined to the classes specified. It does not apply to women.

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SHANGHAI TRAMWAYS.

A Highly Successful Undertaking Using Trailer Cars and Operating a Railless System.

Detailed statistics contained in the report by Mr. Donald McColl, general manager of Shanghai Tramways, for the year 1919, show that the remarkably successful financial results obtained in previous years have been not merely equalled but surpassed. The enormous rise in working expenses experienced by tramways both in Europe and America seems to have affected the undertaking to only a very limited extent.

As an aid to economy in working, the general manager lays stress on the increasing use of trailer cars. While there is undoubtedly a great deal in that, there could be no such financial results without a high degree of administrative skill, and the company is fortunate in possessing a manager of the experience and ability of Mr. McColl. The results illustrate the science of management applied to tramway operation under conditions of exceptional difficulty. The statistics in the report are worked out in fullest detail in many elaborate tables, and the comparisons given with previous years back to 1909 present a wonderful record of steady and consistent progress. This has been secured notwithstanding the fact that the fares charged appear to have been for years the lowest of any tramway in the world. This has rendered necessary the closest study of means to secure economy in working costs, and the results attained in this way in Shanghai as shown by the following table indicate that means may yet be found of effecting substantial saving in tramways in the West.

	1919.	1918.	1917.	1916.	1909.
Miles of route	17½	17½	17½	17½	16½
Gross traffic receipts	2,087,691	1,720,822	1,613,632	1,537,577	557,630
Less loss by currency depreciation	521,385	390,377	354,776	387,510	116,089
Effective traffic receipts ... ... $	1,566,306	1,330,445	1,258,856	1,150,067	441,541
Sundry receipts ... ... $	16,411	6,229	5,050	4,643	12,400
Total effective receipts ... ... $	1,582,717	1,336,674	1,263,906	1,154,710	453,941
Less working expenses ... ... $	802,103	725,063	650,868	594,279	384,128
$	780,614	611,611	613,038	560,431	69,813
Less royalty to Municipal Council ... ... $	78,315	66,522	62,943	57,504	22,077
Working profit (subject to London expenses and depreciation) ... $	702,299	545,089	550,095	502,927	47,736
Passengers	95,038,701	78,683,690	73,461,492	69,089,432	11,772,715
Effective receipts per passenger ... ... cents	1·67	1·69	1·72	1·67	3·86
Working expenses per passenger ... ... cents	0·93	1·00	0·97	0·94	3·45
Working profit per passenger ... ... cents	0·74	0·69	0·75	0·73	0·41
Ratio of trailer car miles to motor car miles	74·51%	68·65%	62·44%	60·02%	Nil
Ratio of trailer car receipts to motor car receipts	71·84%	66·71%	58·70%	56·47%	Nil

The number of tramway employees per million passengers was 40 in 1909 and 14 in 1919 despite reduced working hours.

The average charge per mile is 3·07 cents first-class and 1·86 cents third-class. These fares are reduced by the heavy depreciation of the subsidiary coinage in which the bulk of the revenue has to be collected; the loss for 1919 in converting these coins into dollars was 26·21 per cent.

Economy of Trailer Cars.

Much information is given about this important feature. The car-miles run in 1919 by motor tramcars and trailers were respectively 2,501,598 and 1,863,943, a total of 4,365,541. The ratio of the latter mileage to the former is 74·51 per cent. It is a ratio which has been steadily growing since 1910. In 1918 it was 68·65 per cent., and in 1917 it was 62·44. The passengers per mile run in motor cars averaged 19·35 and in trailer cars 21·38, these being the highest figures on record. The effective traffic receipts per motor car-mile were 34·88 cents, and per trailer car-mile 33·63 cents. These figures also are the highest in the records. The working profit in 1909, when there were no trailer cars, was 47,736 dollars, and for 1919, 702,299 dollars. Of the increase, over 400,000 dollars is attributed to trailer cars, the capital cost of which did not exceed 200,000 dollars. Their light weight and small current demand keep down the amount of power plant and transmission cables required. The cost per car-mile of maintenance of trailer cars is little over one-third that of motor tramcars. No motormen being required, the operating wages are 50 per cent. lower. The current consumption is about 60 per cent. less. Their light weight minimises rail wear, and they involve no overhead equipment upkeep. The stretches of single track prevent the running of an appreciably greater frequency of rail cars, and the success of the fares policy which has brought the enormous volume of traffic now carried has depended mainly on the general employment of trailers. By persistent efforts the prejudices of the Council against trailers were gradually overcome. The last remnant of restriction disappeared with the sanction by the Council on April 1, 1919, of 15 additional trailers, bringing the total to 85, as compared with 90 motor tramcars.

Working Expenses.

The total working expenses per car-mile in 1919 were 17·66 cents, or, including a royalty of 1·72 cents, 19·38 cents. The items are—Traffic, 4·78; general, 3·48; repairs and maintenance, 5·12; power, 4·28. In the previous year the total was 19·25 cents, including royalty, and in 1911 it was 20·40 cents. Owing largely to the great increase in the number of passengers, the cost per passenger has been going down, and the figure for 1919, namely, 0·93 cent, is the lowest yet recorded despite the high prices for coal and other materials. This compares with 3·45 cents in 1909.

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A high standard of maintenance has been continued, and the track, rolling stock, and all equipment are in excellent condition. The expenses ratio to effective receipts and to gross receipts in 1919 is the lowest on record. To effective receipts the ratio including royalty was 55·63 per cent., and excluding royalty, 50·68. To gross receipts it was, including royalty, 42·17, and excluding royalty, 38·42. In 1909 these ratios were respectively 89·48, 84·62, 71·26, and 67·38. Examination of the details of the working expenses show that all the ordinary general charges and the local taxes are included. London expenses and depreciation are, of course, excluded. The expenses for permanent way maintenance include the balance of the cost of electrically welding the rail joints.

Railless Electric Traction.

Correspondingly minute details are given in regard to the receipts and expenses of the railless car route, which is just over a mile long, and has seven cars. The capital expenditure on it, including a *pro rata* figure for land and buildings, was 148,714 dollars. During 1919, 176,997 car-miles were run and 6,785,254 passengers carried, these being the highest figures for any year since the route was established in 1915. The general manager says that the success of the system, from all points of view, for comparatively narrow, congested roads, and for conveying a considerable traffic, has been amply demonstrated, and practically no more rail extensions are contemplated, the railless system being regarded as more suitable for the bulk of the extensions required and to provide inter-running on rail routes where the frequency of rail cars is limited by the stretches of single track which are unavoidable owing to the narrowness of the roads. The average mileage obtained per tire (solid rubber) is close upon 30,000 miles.

Cost of Power.

The average cost of electric energy for traction was 4·96 cents per unit, against 5·14 cents, 3·52 cents, and 2·83 cents for 1918, 1917, and 1916 respectively. The consumption was 0·863 unit per car-mile, and 0·1043 unit per ton-mile, as compared with 1·076 and 0·1246 for 1914. Between 1914 and 1919 the car mileage was increased 38½ per cent. and the passengers 71 per cent., with an increase of only 11 per cent. in the number of units used. One cause of this was the increased proportion of mileage run by trailers, and the other was the success of special arrangements devised by the management to secure economy of consumption.

RAILS FOR DUNDEE.

At a meeting of Dundee Tramways Committee on May 26, it was stated that British steel rail manufacturers practically flouted the £25,000 contract for rails to replace worn-out rails. The Dundee tramways department needed 1,000 tons of 60 ft. rails. Twelve invitations to tender were sent out, but only one reply was received and that came from the United States Steel Products Company, and in this case owing to shipping difficulties the offer received was for 45 ft. lengths. Delivery was promised about the end of the year.

Alderman Malcolm, convener, said that after the receipt of the offer the tramways manager, Mr. Peter Fisher, had communicated with British firms with whom he had been negotiating for points and crossings, and the firms had replied that they could supply British made rails at once. The American offer for the delivery of rails at Dundee was £24 16s. per ton, and the English quotation was a few shillings more per ton but at the place of manufacture. Delivery of 230 tons could be given at once, and 100-ton consignments in August and October at increased prices. Bailie Buist suggested that 500 tons might be taken from the British firm, while a contract for another 500 tons might be given to the American firm for delivery between now and January. After discussion it was agreed to leave the matter in the hands of the convener and the city engineer.

THE DICK-KERR WORKS AT PRESTON.

The second quarterly issue of the *English Electric Journal* (April) contains an interesting article on the Dick-Kerr works at Preston, now one of the manufacturing establishments of the English Electric Company, Limited. The article outlines the history of the works and the range of manufactures in which they are engaged. Although the Preston works were contemporaneous with the application of electricity to motive power, the firm of Dick, Kerr and Company had, of course, a much longer history. In the early eighties, long before their association with Preston began, the company were the first British firm of engineering contractors to specialise in the laying and equipment of tramways. They assisted in the introduction of the grooved girder tramway rail, which has now become universal, they built steam locomotives for the haulage of tramcars, and in 1887 they constructed the first section of the Edinburgh cable tramways.

Transition to work in connection with electric traction thus came naturally to Dick, Kerr and Company, and they had the initial advantage of entering the era of tramway electrification with much valuable experience of other means of town transit. They were, in fact, pioneers in the construction of electric tramways; for in the year 1887 they built the first electric conduit line in the world, that from Gravesend to Northfleet. Ten years later, when the day of electric traction had come, they purchased works at Preston, and brought them up to date for the manufacture of electric tramway cars. The business was managed by a separate company known first as the Electric Railway and Tramway Carriage Works, Limited, and later as the United Electric Car Company, Limited.

Notable Railway Electrification Work.

At that time it was the general practice to import electrical equipment from abroad, but in 1900 the management of Dick, Kerr and Company began arrangements for the manufacture of electrical equipment on a large scale. On a site adjacent to the car works new works were erected by the English Electrical Manufacturing Company, Limited, formed for that purpose, and this company was subsequently absorbed into Dick, Kerr and Company by an exchange of shares. Their arrangements at Preston thus enabled the company to deliver completely equipped tramcars without the disadvantage of having to assemble them at their destination. To-day the total area of the property is 32 acres, of which 14 acres are under roof, and the total floor space is approximately 700,000 sq. ft. Notable among the products of the works in the past are the complete power-house and sub-station equipment of the Liverpool-Southport Railway, the first main line electrification in this country, and the similar equipment of the Manchester-Bury main line supplied in 1914, the first 1,200 volt third rail equipment to be put into operation.

At the present time in the works at Preston there are under construction turbines and generators of 20,000 KW. capacity for the new Dalmarnock station of the Glasgow Corporation, and turbo-generator sets of 10,000 KW. for the new Blackburn Corporation power-house, the first super power-station. The English Electric Company have lately purchased Ashton Park, lying about half a mile from the works, with an area of some 90 acres, as a war memorial, and propose to convert the Manor House into a social club for their workpeople.

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THE
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THE EDITOR will be glad to consider articles by experts. All information of a practical character relating particularly to the engineering and operating branches of transportation will receive prompt attention. Original illustrations will also be welcome.

LONDON, JUNE 10, 1920.

Tramway Statistical Returns.

Tramway officers, directors, and members of tramway committees will be gratified to know that the issue of annual statistical returns relating to every tramway in the United Kingdom is about to be resumed. In the days before the war these returns were issued by the Board of Trade, and were a useful source of information. Financial results occupied a conspicuous place, but many facts as to length of lines, number of cars, passengers carried, and units of electricity consumed were given. With the outbreak of war publication was rightly suspended. Since then the powers and duties of the Board of Trade with respect to tramways have been transferred to the Ministry of Transport, and that Ministry is now engaged on the preparation of a new return dealing with the past financial year. In the interval since the last statistics were issued hardly any additions have been made to the length of track, but the new figures should show large increases in passengers, revenue, and—unfortunately—expenditure. In that connection also they will show how great is the need for the Increase of Charges Act which has just been passed into law, and the text of which is given in this issue. The form of the return is to be somewhat modified with a view to making it more useful. Some readers may remember the effort made years ago to get the Board of Trade to amend the form so as to take cognisance of the fact that all tramcars were no longer hauled by horses or steam engines. The present amendment is being carried out without that trouble. The new issue, we understand, may be expected in a month or two.

Railway Electrification.

The present condition of the market for railway stocks is not very encouraging for those companies who may desire to raise additional capital, so that the policy of the Ministry of Transport to encourage railway companies to carry out with their own capital desirable electrification schemes is not at the moment very hopeful. At the same time, the Ministry has power under the Transport Act to give financial assistance, and in view of the statements of some of the chairmen at the last annual meetings of the companies, something of the kind is expected. However that may be, Sir John Snell, the Chief Electricity Commissioner, in a speech at the annual dinner of the B.E.A.M.A., was most optimistic as to the great development of the use of electricity for various purposes. He evidently expects great things from the inquiry now being conducted by the experts forming the Advisory Committee appointed by the Minister of Transport to advise as to the adoption of a standard type of electrical equipment for railways to be converted. The main point appears to be to secure that electric locomotives belonging to any company shall be able to run over the electrified lines of other companies, so that the running of through trains may be continued or extended. It seems probable that the committee will be some time over their task, because coming to a decision on the point before them can hardly fail to involve raising the vexed question of direct-current traction *versus* alternating-current traction. In the past no reconciliation between the two schools has been reached, and the "doctors" continue strongly to "differ." Perhaps the present inquiry may lead to a solution, though no doubt the old statement will be repeated that in some conditions the one system is the better and in other conditions the

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other. But in whatever way it is achieved the possibility of through running must be attained.

Electric Power Development.

In the speech referred to above, Sir John took a highly sanguine view of the development of electric industries. If he does not speak with authority on the subject no one does, for he has been a member of six out of the seven departmental committees on electrical matters which have been appointed since 1916. Most of these committees, which cover the whole gamut of electrical enterprise, have already reported, and Sir John believes that their work will bring about an era of prosperity in the electrical world such as was never dreamt of in the old days. The Electricity (Supply) Act, which was passed last year, is the outcome of the reports of some of these committees, and it is natural that the Chief Electricity Commissioner under that Act should regard it as the great charter of electricity. One cannot but recall that when the measure was passing through Parliament it encountered much opposition, but on the other hand the withdrawal by the Government of the compulsory powers in it disarmed the criticism. The Bill of the present session again seeks the compulsory powers, but so far it has made little progress. As to the recent development of the supply of electric power, in 1919 the number of units supplied was between three and four times the number in 1913, and Sir John thinks that five years hence the present output will be doubled. Through increased output of plant will come improved methods of manufacture and lower costs, so that the cheery prophet predicted that in ten years there will be an unimagined prosperity for the whole electrical industry. One is glad to know that the Electricity Commissioners are hard at work on the earlier stages of their task, and that they have no idea of sweeping away all existing generating stations and substituting sixteen new and enormous ones. What they wish to do is to weed out the bad stations, improve others, and add large complementary ones as required. That seems a reasonable policy.

Failure of the Swansea Strike.

The longest tramway strike of recent years, that of the Swansea employees, was terminated on May 27 by the men agreeing to return to work two days later on the terms of the National Joint Council's agreement. This awarded to the Swansea employees an increase of 8s. a week, which the men refused, demanding 10s. a week, and this was later increased to an amount that would bring their wages to £5 per week. The directors of the Swansea Tramways Company reminded the men that they themselves, as well as the employees, were bound by the agreement of the National Council, and they declined to discuss the matter until the men returned to work. The latter held out for four weeks, and then capitulated unconditionally; and it may be hoped that the lesson thus inculcated, that agreements freely entered into must be observed, will have useful results throughout the industry. The cessation of the tramway and omnibus services for four weeks was a severe strain upon the patience of Swansea citizens; but it is to their credit that they rightly appreciated the importance of the principle involved, and supported the directors throughout. There were no complaints, and although the Whitsuntide holiday was tramless and 'busless at Swansea, the public never wavered in their determination that the men should be required to carry out the agreement reached by the National Council. The loss to the company is, of course, considerable, but the directors' action will, we are confident, be endorsed by every shareholder. In taking a firm stand the directors have not only acted in the best interests of the company, but they have performed a useful service to the whole industry. During the past few months nothing has been more startling than the freedom with which both tramway authorities and employees have treated their obligations under the Industrial Council of the industry. That Council was formed under a constitution drawn up with meticulous care, and accepted after various emendations by both employers and employees. There was not the slightest reason for either side to take arbitrary action; for there are constitutional means of obtaining reconsideration of any agreements to which objection is taken. The results secured by the Council are so far frankly disappointing, and unless the scheme is to prove unworkable, it is essential that agreements reached by it with the consent of both sides must be loyally supported both

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by employers and the men until such agreements are by due process modified or cancelled.

The Grading Principle Recognised.

Commenting in our issue of May 13 upon the failure of the National Council for the Tramway Industry to arrive at an acceptable settlement, we remarked that "in difficult circumstances the temper of both sides has been excellent; and gradually a workable basis will, we hope, be attained." Since then second and third attempts have been made. These meetings were held *in camera*, but according to the secretary of the Vehicle Workers' Union, the second meeting was without result, and "broke up in disorder." That this ending to the renewed attempt to arrive at a solution of the claim for an all-round increase of ten shillings per week was not a serious hitch was shown by the readiness with which the two sides met again a few days later, after interviews with the secretary of the Ministry of Labour. Their subsequent deliberations served to secure terms a long way in advance of what the union's representatives accepted at the beginning of April, when they agreed to an immediate increase of five shillings a week for employees over 18, and another shilling as from June 1. While the employees abandoned their contention that there should be a national wage standard, and agreed to accept a grading system of from seven to nine shillings a week on the principle of the Lancashire settlement, the employers assented to a flat rate increase of nine shillings for the London area in lieu of a graduated increase. The carrying of the terms to completion depends in the first place upon the decisions of the District Councils as to the grading of the districts, cases of disagreement being referred to the National Council for a final decision. While it is satisfactory that the dispute is likely to be resolved without the evil effects that would be engendered by further strikes, there is need for the District Councils to take steps to place the decisions before the travelling public in their respective areas. This is more particularly to be desired because further advances of fares are inevitable if the money is to be found for the payment of the increases. At present the employers are left single-handed to face the criticism and wrath. This publicity is especially desirable in the case of the Metropolitan area. The burden of the nine shillings advance will be felt by both large and small undertakings. An indication of the seriousness of the position is given by the fact that the London County Council is faced by the necessity of raising its fares without taking into account the new addition to wages.

Big Railway Termini and Electric Traction.

At the annual meeting early in this year of the Great Eastern Railway Company, the chairman mentioned that the general manager had been commissioned to examine the question of adopting electric traction for the suburban lines of that company. The fact lends added interest to certain passages in a paper on "Some Railway Operating Problems," which was read by Sir Henry Thornton, the general manager, at a meeting of the Institute of Transport on May 17. The difficulties of working the enormous passenger traffic in and out of the Liverpool Street terminus in the City of London during the busy hours of the day are well known, and traffic in these hours ever becomes still more acute. Sir Henry gave an idea of it in the pregnant statement that from five to six o'clock in the evening eleven suburban passengers per second leave Liverpool Street Station. In order to make the best possible use of the existing steam traction, careful investigations of train working have been carried out, with the result that it is hoped to increase the existing heavy train service during the crush periods by no less than 40 per cent. Sir Henry recognises that engine terminal working and low acceleration are two great factors against steam as compared with electricity. The more rapid entering and clearing out again of an electric train is possible provided there is no fouling of other trains. With existing lines where outgoing trains do foul incoming trains, the general manager says, most of the advantage is lost. Thus the electric gain is reduced to one of the difference of acceleration between an electric and a steam train. Perhaps the reply will be made to this that a different arrangement of tracks might be made to suit altered conditions. Sir Henry Thornton has evidently something of the sort in mind himself, and he is not despairing. He says that the whole matter translates itself into terms of money. That is to say, there must be better terminal facilities, more main lines, and unquestionably very large employment of electricity. It is a long time since electrification was first suggested as a solution of the difficulties of the Liverpool Street terminus, and it may be hoped that a plan will be reached from the studies now being made.

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LONDON'S TRAFFIC PROBLEM

LORD ASHFIELD'S SUGGESTIONS FOR ITS SOLUTION.

Lord Ashfield, chairman and managing director of the London Underground Group of Transport Organisations, has contributed a very interesting and cogent article to the *Nineteenth Century and After*, discussing London's traffic problem and the broad lines on which its solution should be approached. The article occupies the place of honour in the May number, and is of considerable length. By the permission of the Editor we give the following abstracts from the article, which is of special importance at the present time when decisions are about to be taken that will have far-reaching consequences on the future development of transport in the Metropolitan district :—

Railways, tramways, motor routes are alike in purpose, though different in form. The tendency is to judge them by their form and to insist on their diversity, forgetting almost wholly their essential likeness as carriers of passengers. If it is considered that a railway, or railroad as it may be better named, is but a special type of street, one common aspect of the three is more quickly recognised, and one common problem of the three more easily solved.

There is a street, and in it passengers requiring to be carried along its way. At first the passengers are few, and a motor omnibus serves ; then the passengers increase in numbers, and more and more motor omnibuses are added until there comes a time when the street is full of vehicles. For after all the motor omnibuses are only a part of the whole vehicular traffic. The street must be widened to relieve the congestion, and the question that should present itself is whether a new and special street should not be built to take off one class of the traffic ; it may be heavy goods, but it is much more likely to be passengers. This special street may be underground, as in London, or elevated, as in New York, but it is only a special street where greater speed is possible and fewer interruptions from cross and converging traffic are experienced.

So far as London is concerned this question has never presented itself in this simple form. Always there has been resort to a method of solution which points to another phase of the problem. An effort has been made to cut down one or even both sides of the street, set back the buildings, and so secure a greater width. That this should be so is possibly a judgment upon the extraordinary lack of foresight which allowed London to grow to its present size without proper plan or reasonable co-ordination.

The tramway, Lord Ashfield points out, is intermediate between a motor route and a railway, and it enjoys severally the virtues of both, but it accumulates their defects. It needs a costly special track with its equipment like a railway, and that special track is subject to all the hazards and delays of the street, which means no advance in locomotion over the motor route.

In America there are practically no motor routes. The motor omnibus (except for the Fifth Avenue Coach Company of New York, which has a special sphere of influence there, and works about 300 motor omnibuses) is a new thing, and its development is only just beginning. There have been street railways for many years, not stereotyped like the tramways of England, but always progressing in design and construction and in methods of operation. The street railway has so far met the needs of the expanding cities out there efficiently and well. But there comes a time when the expansion is too great even for the most efficient street railway to meet the public demand for travel. It is generally recognised that when the population tends to reach the second million the time has come to resort to some other instrument of travel.

Two causes lead up to this conclusion. First, the city has spread out over a territory extending some eight miles or more on every side from the centre. The time taken on the journey between the centre and the fringe of the built-up districts, under ordinary street conditions, is prolonged to fifty minutes or more, which is felt to be too extravagant a consumption of the working day. Second, the size of the city is the index to the magnitude of its business, and this business has filled the main radial routes with a great volume of vehicular traffic, to be in itself a hindrance to speedy movement ; and has created a density of passengers at certain busy hours on those radial routes with which a street railway, still less a motor route, cannot satisfactorily cope. What is needed is grasped at once in America. It is a special street above or below the existing surface street upon which the passenger traffic can be carried conveniently and quickly. The obstacle in resorting to this remedy is the capital invested in street railways. There is rarely enough passenger traffic on a radial route to support both an expensive elevated or underground railway and an expensive street railway or tramway. American cities are one by one being compelled to face the loss which such a conjunction involves. It is this obstacle which is now slowly directing attention to the motor omnibus.

The motor omnibus is just what is required to supplement and feed a railway. It has no fixed capital in track and equipment. It is not tied to a route. It can follow the passenger traffic to its source, or it can lead the way to new settlements. It can take up the casual short-distance passenger, and by a complex ramification of routes, each independently worked, meet his closest requirements. All the while the main volume of passengers can be carried swiftly in the leading directions by the special railroad system without occupation of the street capacity. Once a city passes a certain size the street railway solution of the traffic problem is seen not to have been the right one. The street railway is an intermediate solution good until a more highly specialised scheme of transport facilities is wanted.

The problem is not so much to deal with what the city is, but to deal with what the city may become. It is a failure to understand this which has made the problem for London so acute. Before this problem can be solved correctly someone must decide what the London of the future is likely to be.

Everyone realises now that it will be disastrous if London is allowed to grow greater without proper measures being taken to co-ordinate public services and requirements of all kinds. A proposal is already under weigh for the construction of a series of satellite towns within a distance of 30 miles of which the first is to be at Welwyn. This decentralisation can only apply to certain interests, for if it is complete then the satellite has become an independent unit. Such experience as there is here and in other countries shows that a metropolitan city exercises an influence over a very wide area, and that such influence cannot be effectively counteracted. Hence it is perhaps wiser to allow for the growth of London as a single unit. It has the advantage of avoiding the mixture which a series of satellite towns implies. It is the ideal plan that is missing. Some conception of the final fitness of the parts to each other and to the whole is wanted.

What must be demanded is not a town planning scheme, for there are many such in and around Greater London, but quite a different thing—a metropolitan plan which shall say that homes may be here, business and trade quarters there, that factories may be here, parks and open spaces there, following the natural fitness of the locality. When the tract of country which is to be covered by London is at last tentatively surveyed, and the places to be served are known and the kind of service required indicated, then it will be possible to proceed to lay out the means of transport which will most suitably meet the case. Meanwhile it is only possible to assume that London will be built up to a circle of 15 miles radius of Charing Cross, and that provision must be made for dealing speedily and promptly with considerable daily numbers of passengers up to such a distance from the centre.

More important than the capacity of the transport facilities, for mere multiplication of services will meet this, is the speed. The whole groundwork upon which a healthy metropolitan city can be reared is high speed. What time will a regular passenger give for his journeying day by day between his home and his workplace ? Not much more than 45 to 50 minutes. Given a practical time limit such as this, the speed governs the distance that can be served.

The present average speed of the underground railways is about 18 miles per hour ; so in 30 minutes nine miles can be covered. By the present non-stop working this speed is raised to about 25 miles per hour, and the distance covered in the time correspondingly extended to 12 miles. The number of stops is the real factor governing the speed. The average distance between stations on the underground railways is about half a mile, on the main line railways over a mile. The demand for frequent stops on a railway is short-sighted, and the tendency for the future must be to space out the stations on urban railways more widely apart, leaving to the tram or omnibus the task of the more detailed distribution of the passengers and the carriage of those travelling comparatively short distances. It will then be possible, with the aid of improved equipment, to raise the average speed of a suburban railway service to 30 miles per hour, and so cover the circle of 15 miles radius from the centre in 30 minutes, which, as already shown, is, as nearly as may be, the problem to be solved.

Turning to street transport agencies, the omnibus is more speedy than the tram for several reasons. The average speed of trams in London is about nine miles per hour, and of omnibuses about 10·5 miles per hour. The distances which they can cover in the allotted journey time are therefore five and six miles respectively. This affords the most conclusive argument against either of these agencies taking a place as the mainstay of passenger movement in a Greater London. Both must be auxiliary to railways, and as an auxiliary the omnibus has great advantages.

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The importance of this question of speed will compel resort to new measures for London almost at once. The present underground railways will have to be supplemented by additional high-speed railways, with fewer stations, running north and south under or alongside the Baker Street and Waterloo Section of the London Electric Railway, and east and west under or alongside the District Railway. This step will be enforced by the need for greater speed, and will also serve to relieve the congestion which has given to those two railways an unenviable distinction. Apart from these essential railways, the present costs of underground railway construction are prohibitive of any general scheme of new construction, and on this account the further development of the underground system must rather be at the expense of the suburban branches of the main line railways. There are many of these which could, with little new construction work, be linked up to the present underground railways, or to the suggested new high-speed railways, and without break of journey carry the passenger direct from his outlying suburban home to his central place of business. The experiment of running to Watford over the London and North-Western Railway has shown the advantage of this; the through working over the Central London and Great Western Railways to Ealing cannot but confirm it; and the future progress of the underground system for the next few years at any rate must turn upon the general acceptance of this policy.

Still another development may be anticipated. Unless petrol or petrol substitutes fail, which is almost unthinkable, this country must tend more and more to become a motor country. Already there are signs of it. This burden of delay will grow too great for the motorist to bear. He will demand driveways reserved for fast traffic alone. Possibly London will want fast-running motor roads across its congested centre in all directions, and these can only be found by enclosing a new road in a shallow subway under the existing road.

Although the factor of speed is emphasised, it is not to the neglect of the factor of capacity. The real criterion of capacity is the number of seats in a traffic unit—a train, a tram with its trailer, a motor omnibus. When the underground railways were built, the designers made inadequate provision for trains of the length which now seem to be requisite.

Turning to street passenger vehicles, the standard tramcar of the London County Council seats 78 passengers, and when coupled with a trailer 132 passengers. The present motor omnibus seats 34, and the new omnibus, under construction for the replacement of the present fleet, 46. This must not be regarded as the limit to the seating capacity of a motor omnibus. An experimental vehicle is being built in this country to seat 56. In the controversy of tram *versus* omnibus, the future course of design will surely bring them much more closely together as traffic units, and will thus destroy much of the case advanced in favour of the tram.

The maximum capacity of a transport agency turns not only upon the possible size of the traffic units employed, but also upon the frequency of service with which they can be operated. It is possible with electrically-controlled automatic signalling to bring the capacity of a single track of railway up to 40 trains in the hour in one direction. The highest number worked in one hour on the Underground system has been 43. The number of passengers which can be carried in the hour on the basis of the seating capacity of the trains is therefore about 13,500, or with 50 per cent. of standing load about 20,000. A tramway track worked by trams and trailers attached is found by observation to permit of the movement of 65 units in one direction in the hour. The number of passengers which can be carried in the hour on the basis of the seating capacity is therefore about 8,500, or with a complement of standing passengers about 10,000. It is not suggested that 65 is the maximum possible movement. The maximum possible passenger movement may be taken as 12,500. An arterial road used by motor omnibuses is found by observation to permit of the working of 150 in each direction in the hour, which on the basis of 46 passengers to the vehicle means a total possible passenger movement of about 7,000 in the hour, or on the basis of 56 passengers to the vehicle, 8,500. In comparing tram and omnibus it is assumed that the roadway is sufficiently wide to permit of at least four lines of traffic, two in each direction. The railway on these figures is clearly best adapted to the movement of heavy densities of passengers, the tramway second, the motor route third; the difference between tramway and motor route constantly diminishing. The conclusion already indicated is therefore confirmed, which is that railways are essential to free and extensive passenger movement in a metropolitan area, and that as auxiliary to railways (which take off the heaviest traffic) the motor omnibus has distinct advantages over the tram.

This is more marked if consideration is given to the capital and operating costs. Taking capital first. A railway underground costs between four and five times a tramway, leaving out of count the cost of the street to the tramway and the cost of the acquisition of rights of way to the railway. If street cost were added to the tramway there would be many instances where it amounted to more than a railway. A tramway for a given maximum service costs more than thrice as much as a motor route worked to the same extent, ignoring differences in seating capacity. Next taking operation: A tramway and a motor route cost per mile run almost the same sum, as might be expected, the advantage resting with the tramway, and both cost over half as much again as a car-mile on a railway. If all elements of cost (i.e., operating expenses, reserves, fixed charges, and reasonable interest) are brought together it will be found that the costs of the various transport agencies are approximately alike, being in the ratio of 21 for a railway car-mile to 22 for a tramway car-mile and 20 for a motor omnibus mile. It is only fair to add that the seating capacity is as 48 is to 78 is to 46, so that the cost per seat-mile is as 44 for a train is to 27 for a tram is to 43 for an omnibus, which brings out the economic advantage of the tramway. This economic advantage is, however, lost by the operation of lightly loaded large units throughout the day. If, in place of the seating capacity, the average passenger load carried were applied the ratio would be as 123 is to 71 is to 74, where the same factor now prejudices even more severely the railway.

Unfortunately, while the case against the tramways from several points of view appears very strong, there is a large vested interest in the tramways of London already in existence amounting to £23,000,000. It is impossible in these days of economic hardship to advocate a bold and courageous policy of scrapping, even if it were right. The evidence is not sufficient to warrant the assumption that it is right, but it is sufficient to deter any further ventures in tramway enlargement and construction. The programme before a tramway undertaking upon a review of modern progress must, it is suggested, be limited to the consolidation and completion of the existing system, the straightening out of routes, and the modernisation of their equipment.

The real cause of there being any traffic problem at all is largely due to this conflict of interests. The essential condition precedent to any attempt to achieve a satisfactory solution is to secure a unity of financial interest, not at all necessarily by municipal or state ownership, but preferably by a traffic pool, out of which the losses of one transport agency may be met out of the gains of another.

Upon the form there is no doubt that a single dictator would be most effective if he had a wise experience and a careful judgment. A representative body is unwieldy, unswift, uncertain, and uninformed. On the other hand, it is always imbued with a spirit of compromise and endowed with a liberal measure of common sense, so long as the questions debated in it are not coloured by party politics. There is the risk that traffic being mixed with party politics now, it may not be possible to unravel the two, and in such event control of traffic by a representative body becomes hopeless of benefit.

It is suggested that if the local authorities were to divest themselves of their executive functions in relation to traffic arising out of this ownership and operation, they would entitle themselves to exercise much wider administrative functions of regulation and control.

There are two alternative solutions of the problem of traffic control in London. There is the board or commission of three members, whose task is that of adjudicating in a fair and impartial manner upon the disputes coming before them with a view to smoothing out all the obstacles to a co-ordination and development of all transport agencies. Or there is the turning over of all transport agencies to private enterprise and the arming of the local authorities, severally and jointly, with such powers as may be requisite to secure the conduct of traffic in a fair and impartial manner towards the public. The advantage of private enterprise is that the business must be managed and conducted on a commercial basis, even on a competitive basis. Competitive management does not imply competitive finance. Thrice already the omnibus industry has risen to opulence only to fall later into penury. When the common fund was set up under the London Electric Railway Companies Facilities Act, 1915, the London General Omnibus Company was well enough off to assist the Underground Railways. At the close of 1919 the Underground Railways had to come to the assistance of the omnibus company to meet its working costs. The old saying that what you gain on the swings you lose on the roundabouts is very applicable to London traffic, and affords a good reason for some pooling scheme, which, subject to full publicity and with the supervision of those concerned with the public interests, cannot but be helpful and fair. To sum up—

(*a*) A general plan for the layout and development of the whole of the Metropolitan area in which the small town-planning schemes may take their places.

(*b*) A scheme of transport facilities which will be carried into effect as the development takes place, and ahead of that development, and which will afford speedy and convenient means of communication.

(*c*) A transfer of all transport agencies to private enterprise, subject to public control, and the establishment of a pooling scheme under which measures of co-ordination may be taken without prejudice to any specific interests.

(*d*) A unification of control into the hands of either a statutory board or commission, or, subject to (*c*) above, a statutory authority composed of representatives of local authorities within the area, pending the setting up of a provincial government for London as a whole.

The conclusions appear simple, but it is in appearance only; underlying each of them are controversies which can only be settled by men of good will.

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FINANCIAL POSITION OF AMERICAN PUBLIC UTILITIES.

HIGHER FARES ENCOURAGE CONFIDENCE AND ATTRACT NEW CAPITAL.

In view of the many difficulties in which tramway undertakings and other public utility services in this country find themselves, it is interesting to note a brief but comprehensive article on the aspects of the same subject as existing in the United States of America, which has been contributed to a recent issue of the *Electric Railway Journal*, of New York, by Mr. Orlando B. Willcox, vice-president of Bonbright and Company, New York. Mr. Willcox takes quite a hopeful view of the future, as will be seen from the following abstract from his article.

Referring first to the conditions of things before the war, he says that the nickel fare for the usual street railway ride was well established. In other branches of public service the normal growth of the business, the construction of larger plants, with improvements in the art permitting economies of operation, and the adoption by the companies of the principle in operation that large turnover at reasonable rates made for safe and profitable business, led constantly to lower rates for service. The public interest appeared to be primarily in low rates. The effect on the communities and on the industry of the country of cramped and poor service and their need for first-class and constantly expanding service were not yet fully apparent. The Public Service Commissions, during the period of low costs and increasing economies made possible by larger units of operation, were appealed to only to reduce rates. The duty of the Commissions seemed to them in nearly all the early cases of regulation to require the reduction of the net earnings of utilities through decrease in the rates charged for service.

The principle was adopted that rates should be fixed so that they should provide no more than a fair return on the property, and the value of the property was considered and appraised, sometimes without recognition of elements of real value and substantial cost, thereby reducing the total amount on which the return through rates was to be fixed. The rates, on the other hand, were sometimes fixed so low as to permit only a bare interest return on the value of the property. The public interest in low rates was assumed to be greater than the public obligation to safeguard the owners of utility properties and securities. The results were soon apparent and directly affected the public interest, not alone in losses sustained in investments already made, but also in the refusal of free investment capital to flow into public service. The large amount of capital required for the expansion of public service to meet the demands of a rich and growing population could not be readily obtained from the investor and the public service suffered in consequence. This condition was much emphasised during the war by the increased costs of operation, as well as by the increased requirements for all kinds of public utility service. There was very general demand for more electric power and electric light, extended and more efficient wire communication, better and more satisfactory local transportation. The required expansion and improvements in the service could only be provided by additional capital expenditures, and the investors of the country refused to provide the necessary funds by the purchase of utility securities.

This condition led rapidly to the recognition by the Commissions, as well as by officials and the public generally, of these important principles. That the public required for its well being adequate and constantly expanding public utility service; that the real interest of the public was in good service, expanding rapidly enough to take care of increasing demands, rather than in cheap service and low rates; that such service could not be afforded by companies which were insolvent or threatened with bankruptcy; that the investors of the country would not provide the very large sums necessary to refund maturing obligations and to provide the expansion of utility service demanded by the growth of population and of industry unless their investments were both protected and assured an adequate return comparable with the profits offered in unregulated industries, and that, under public regulation, rates must be so fixed that they would provide a fair return on the capital invested and give the operating companies such surplus and such credit as would attract new capital into public service under private operation.

Those principles found their way into the decisions of the Public Utility Commissions, not only in cases where applications had been made to reduce rates but also in those cases in which applications were made on behalf of the operating companies for an increase in rates on showing that such increases were required in the public interest.

The responses of the public Utility Commissions were more prompt and effective than might have been possible except for the compelling force of the conditions resulting from the war. The electrically equipped interurban and local transportation lines have not yet all fully worked out their problems, although reports indicate that street railway fares have been increased quite generally to meet higher costs and to assure continued service (New York City is a notorious exception); that notwithstanding higher fares more people are riding on street cars than ever before, and that many street railway companies are earning a fair margin over all charges. Other classes of utilities reflect, in their increased gross and net earnings, the recognition of their real importance as an essential part of the great American industrial system and as well the flexibility of public regulation in accommodating its functioning to changing industrial and economic conditions. These increased earnings of the utility companies mean more than protection to investments or inducements to new capital. They mean appreciation by the public and its official representatives that the public interests in provision for time and labour and money saving machinery through privately-owned public utility enterprises can be served not by low rates, which will imperil invested capital and repulse new capital from these industries, but only by such treatment in appraisals of the value of property devoted to public use and in the regulation of rates as will give these companies credit in financial markets and such measure of prosperity as will attract capital and encourage expansion.

The peak of high operating costs seems to have been reached and is passing, if it has not already passed. The more favourable attitude of customers is indicated in the acceptance of higher rates for service as part of the general advance in all commodities. The public has seen that utility rates must move up in times of higher costs, and not always down, and that the successful operation of public service companies with resulting good service requires a sufficient financial return on the investment and the payment of current rates for new money for expansion. The operators feel new confidence in their properties and their future. The money market provided more money for utilities in 1919 than in any year during the war. The credit of utilities is improving and, with a continuance of the rate of earnings indicated by the current reports, is in a fair way to be re-established, by a history of stability of market and gross receipts and adequate margins above charges, on a basis again commanding the confidence of the investors and permitting permanent financing at reasonable rates for the very large new capital required to keep up with the demands for growth of the industry.

Conclusions.

Several conclusions may be drawn.

1. The public and the officials have fairly recognised the essential character of such utilities in modern industry, the need of their expansion to meet the demand for their service and the necessity of fair earnings, predicated upon fair appraisals and fair rates, to establish the credit necessary to attract free capital for expansion. The dangers to the community of low rates and confiscatory values have been recognised, and return is not probable because the public served would be the greatest sufferers and not the owners of public utility securities.

2. If, as competent authorities are pretty well agreed, the peak of commodity prices and other items of the costs of operations has been reached, it may be expected that the present favourable showing of such utility companies will continue and that their operating costs will consequently, if gradually, decrease, with resulting increase in their net earnings and the margin above interest and dividend charges.

3. The recognition of these conditions by bankers and investors should undoubtedly lead to a substantial increase in the price level of the outstanding securities of those utility companies, especially the electric power and light and the gas and telephone companies, which have survived the disorders of the past few years; this increase in the price level should, because of the factors involved, be more rapid than the increase in the price level of long term bonds generally, which should follow the approach of a normal ratio between commodities and the dollar.

4. The electric power and light companies particularly are not dependent upon large amounts of labour and are therefore relatively free from the effects of labour unrest and disorders.

5. The high costs of labour generally, which will undoubtedly prevail for some time, makes ever-increasing demand for time and labour saving machinery, which in modern industry is dependent upon electrical energy. Central station power can be provided cheaper than power from isolated manufacturing plants. Therefore, there must be a great expansion of the electrical business in the United States, with resulting offers of electrical utility securities.

6. Both Commissions and operators have recognised depreciation and obsolescence of plants as proper charges as one of the costs of operation, and electrical securities will be increasingly protected by adequate reserves against these costs.

7. Many unregulated industries will be unfavourably affected by competitive production and falling prices, which on the other hand should act favourably upon electric companies.

8. The street railway companies are sharing the improvement in public utility conditions; the fetish of the nickel fare (2½d.) is losing its hold on the public mind and has been overcome in hundreds of communities where more riders are paying higher fares. Many street railway companies are showing good earnings and a safe and increasing margin above charges, and the financial condition and investment position of street railways may be expected constantly to advance.

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TRAMWAYS (TEMPORARY-INCREASE OF CHARGES) ACT, 1920.

The following is the full text of the new Act, to which the Royal Assent was given on May 20. This Act was introduced by the Minister of Transport and passed by Parliament after consideration by a Select Committee of the House of Commons, in order to enable tramway owners to secure an increase in the statutory fares. This is necessary in many cases to put the undertakings in a position to pay the increased wages that have recently been granted to the employees.

AN ACT TO MAKE FURTHER PROVISION FOR THE TEMPORARY MODIFICATION OF THE CHARGES WHICH MAY BE MADE IN RESPECT OF AND THE OBLIGATIONS AFFECTING TRAMWAY UNDERTAKINGS.

Be it enacted by the King's Most Excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows.

AMENDMENT OF S. 1 OF 8 & 9 GEO. 5, C. 34, IN ITS APPLICATION TO TRAMWAYS.

1.—(1) The limitations contained in the proviso to sub-section (1) of section one of the Statutory Undertakings (Temporary Increase of Charges (Act, 1918, (hereinafter referred to as the principal Act) shall not apply in the case of orders made after the passing of this Act by the Minister of Transport in relation to tramway undertakings) but in lieu thereof the following limitations shall apply—

(*a*) Where the undertakers are a local authority, no modification in the statutory provisions regulating the charges to be made by the undertakers shall be authorised which is more than sufficient, so far as can be estimated, to enable the undertaking to be carried on without loss; and

(*b*) In any other case, no such modification shall be authorised which is more than sufficient to provide, with due care and management, for interest on loan capital and for a reasonable return on share capital, regard being had to the pre-war financial condition of the company, and its prospective development.

(2) An order authorising any increase in the statutory maximum charges applicable to a tramway undertaking may attach such conditions thereto as the Minister may think proper, and may modify any statutory provisions, and the provisions of any agreement, whether or not confirmed by an Act or order having the force of an Act, which impose obligations on the undertakers as to the frequency of any tramway service.

(3) Before making an order in pursuance of the powers conferred by the principal Act as amended by this Act the Minister shall refer the matter to the advisory committee hereinafter constituted for their consideration and report.

Provided that, if in the case of any tramway undertaking it appears to the Minister that there is ground for making an order and that the case is one of urgency, he may, without any such reference and without any such notices as are required by the principal Act, make an interim order increasing the statutory maximum charges by such amount, not exceeding one hundred per cent., and subject to such conditions, as he thinks proper; but an interim order shall not remain in force more than six months, and, where any interim order is made, the Minister shall forthwith refer the matter to the advisory committee.

(4) The charges authorised by any order made under the principal Act as amended by this Act may be charged notwithstanding any statutory provisions or any agreement whether or not confirmed by an Act or order having the force of an Act.

(5) If at any time it appears to the Minister of Transport that, owing to changes in the cost of labour or materials or other circumstances affecting a tramway undertaking with respect to which an order has been made, the powers of charging effected by the order are insufficient or excessive for the purposes aforesaid, the Minister may, and, if representations to that effect are made to him by the undertakers or by the local authority of any district served by the tramway, or in case where the local authority are the undertakers by twenty ratepayers in the district, he shall refer the matter to the advisory committee hereinafter constituted, and may, after considering any report of the committee, make an order revising the powers of charging so authorised as aforesaid; so, however, that revised maximum charges shall not in any case be less than the statutory maximum charges applicable to the undertaking.

ADVISORY COMMITTEE.

2.—(1) For the purpose of giving advice and assistance to the Minister of Transport with respect to the making of orders in relation to tramway undertakings and for safeguarding the interests of users of tramways, a committee shall be constituted consisting of the Light Railway Commissioners and such members of the panel set up under section twenty-three of the Ministry of Transport Act, 1919, (9 & 10 Geo. 5. c. 50) as the Ministry may appoint for the purpose, and such member as the Minister may appoint shall be chairman of the committee, and the committee, if so authorised by the Minister of Transport, may delegate to sub committees thereof any of its powers and duties under this Act.

(2) The committee, before reporting or advising on any matters referred to them under this Act shall, unless in their discretion they consider it unnecessary or undesirable to do so, give such public notice as they think best adapted for informing persons affected of the date when and the place where they will enquire into the matter, and any person affected may make representations to the committee, and, unless in their discretion the committee consider it unnecessary, shall be heard at such inquiry, and, if the committee in their discretion think fit, the whole or any part of the proceedings at such inquiry may be open to the public.

Provided that, for the purpose of this provision, the council of any city, borough, burgh, county, or district shall be deemed to be persons affected in any case where such council or any persons represented by them may be affected by any proposed order.

(3) The committee shall hear such witnesses and call for such documents and accounts as they think fit, and shall have power to take evidence on oath, and for that purpose any member of the committee may administer oaths.

SUPPLEMENTAL PROVISIONS.

3.—(1) The Minister of Transport may, for the purposes of this Act, employ such accountants as he may think fit, and it shall be the duty of tramway undertakers to furnish to any such accountant such information and to produce to him such accounts and books as he may require for the purpose of reporting to the Minister or the Advisory Committee as to the financial position of the undertaking.

(2) The costs incurred by the Minister in connection with any application for an order under this Act, including the remuneration of any such accountant, shall be paid by the undertakers, and the Minister of Transport may certify the amount of the costs incurred, and any sum so certified and directed by the Minister to be paid by the undertakers shall be a debt to the Crown from those undertakers.

(3) For determining the cost of labour for the purposes of this Act, the Minister of Labour shall, at the request of the Minister of Transport, certify what are the rates of wages which have been fixed either by the National Joint Industrial Council for the tramway industry or by an award under the Industrial Courts Act, 1919, (9 & 10 Geo. 5. c. 69).

(4) For the purposes of this Act, statutory maximum charges shall not include any charges authorised by an order under the principal Act or this Act.

(5) For the purposes of this Act, the word "tramway" shall include light railways constructed wholly or mainly on public roads, and, where a tramway undertaking is leased to or worked by a company or person other than the owners thereof, "undertakers" shall, for the purposes of the principal Act and this Act, include that company or person, and, where a tramway undertaking is leased to or worked by a company or person other than the owners thereof, "undertakers" shall, for the purposes of the principal Act and this Act, include that company or person.

SHORT TITLE, CONSTRUCTION AND DURATION.

4.—(1) This Act may be cited as the Tramways (Temporary Increase of Charges) Act, 1920, and shall be construed as one with the principal Act.

(2) Notwithstanding anything in the principal Act, that Act as amended by this Act shall, in relation to tramway undertakings, have effect until the fifteenth day of February nineteen hundred and twenty-three.

LONDON UNITED TRAMWAY FARES.

FIRST ORDER OF MINISTRY OF TRANSPORT UNDER NEW ACT.

The first order issued by the Ministry of Transport under the Tramways (Temporary Increases of Charges) Act, 1920, which recently received the Royal Assent, is that authorising the London United Tramways, Limited, to increase their fares for ordinary passengers by 50 per cent. By an agreement with the local authorities concerned the order provides that there shall be no alteration in workmen's fares, and a further condition stipulates that no increased interest or dividend shall be paid until full provision has been made for repairs and renewals.

Under the new scale of charges the minimum fare is 1½d. (two stages), three stages 2d., five stages 3d., and for each additional two stages 1d. The existing stages have not been altered in distance and to the long distance traveller the new fares will make no appreciable difference. For instance—The present fare from Shepherd's Bush to Hampton Court is 10d.; Hammersmith to Twickenham, 6d.; Tooting to Hampton Court, 8d.; Hammersmith to Hounslow, 6d.; Shepherd's Bush to Uxbridge, 10d. The new fares mean an additional penny on the Hammersmith to Twickenham and Hammersmith to Hounslow routes.

By an agreement with the London United Tramways, the omnibus fares in the same district will be revised to conform to the new scale of tramway charges.

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WAGES NEGOTIATIONS.

SETTLEMENTS BY DISTRICTS.
ALTERATIONS OF BASIC RATES GIVE EMPLOYEES AN INCREASE OF FROM 7s. TO 9s. PER WEEK.

Although by an agreed decision of both the employers' and employees' sides of the National Industrial Council for the Tramway Industry an increase of 6s. per week was granted to all employees throughout the country, the decision was not accepted by the employees, who insisted upon further concessions. In a number of towns there were strikes, and in some cases the men's full demand for an increase of 10s. per week was granted. The whole question was as a consequence again taken up by the National Council, which finally requested the District Councils of the seven areas to endeavour to arrive at separate agreements in regard to basic rates to be paid by undertakings in their respective areas. During the past few weeks the District Councils have been busily engaged in the task assigned to them and at a meeting in London on May 28 their reports were submitted to the National Council. The minutes and records of that meeting and of another held on June 6 are summarised below.

MEETING OF THE NATIONAL COUNCIL HELD AT MONTAGU HOUSE, LONDON, ON FRIDAY, MAY 28TH.

Mr. S. Hirst, vice-chairman, presided, and the following members were present—*For the Employers*—Sir John W. Courtis, Aldermen Wylie (South Shields), Craddock, (Wolverhampton,) and Brown (Leeds); Councillor Higham (Blackburn); and Messrs. J. C. Spencer, W. G. Bond, E. H. Edwardes, J. B. Hamilton, H. England, E. Garcke, T. B. Goodyer, W. G. Verdon-Smith, P. Fisher, and C. R. Tattam. *For the Employees*—Messrs. N. Bradwell, H. Allen, J. W. Eccles, E. H. Bowden, A. Tackley, W. Anderson, E. Smith, C. Black, W. Stark, C. Tillings, D. Paterson, R. Powell, W. Dakin, J. Dunicliff, T. McLean, W. Davies; and the joint secretaries, J. Beckett, J. Cliff, and A. de Turckheim.

Letters intimating inability to attend were read from Councillor Squires (the chairman of the Council), Councillor Timpson (Mayor of Portsmouth), Mr. J. M. McElroy, and Mr. Robert Williams.

The secretary was instructed to convey to Mr. McElroy the hope of the Council that his improvement would be continued, and to send a similar message to Mr. A. Baker.

The following reports from the nine District Councils upon their proceedings in relation to the reference to them by this Council on April 23, 1920, were submitted. The reference was as follows—"That the seven District Councils that have been unable to arrive at any definite recommendation be afforded a further opportunity of reconsidering the application referred to them, and be requested to endeavour to arrive at an agreement within a month in regard to the basic rates to be paid on the various undertakings in their area. In the event of no agreement being arrived at, the District Councils shall remit the case to this Council, which may refer the matter for settlement to an arbitrator to be appointed by the appropriate Ministry. That the definite recommendations now submitted to this National Council by the South Wales and Midlands District Councils be ratified."

AREA A.—SCOTLAND.

The following report was submitted of proceedings on May 7—

(1) *Proposal by the Employees*—"That for the purpose of opening up the discussion, we, the employees' side, owing to the present basic rates of the tramways undertakings in Scotland being in general far below the basic rate of the unskilled labourer, move that this Council agree to a 1½d. advance in the basic rate.

(2) *Proposal by the Employers*—"That in the opinion of this Council the tramways undertakings in Scotland are not in a position to grant any increase in the basic rates, having regard to the recent award granted on March 31, 1920."

The employees' representatives intimated that they were willing to agree to the insertion of 1d. instead of 1½d. referred to in this resolution, but no decision was arrived at.

AREA B.—NORTHERN.

Decision of the District Council at a meeting on May 6—

"That the Council agrees to grant an increase of ¾d. per hour, or 3s. a week on basic rates, for all employees concerned, of 18 years of age and over, subject to a committee of four from each side being set up to inquire into the grading, if any, that shall take place on the undertakings that claim they are unable to pay the full increase mentioned above. The sub-committee to report to the full Council within ten days."

The sub-committee has adopted the following resolution—

"Having heard the appeal of the Sunderland and District Electric Traction Company, Limited, this committee decides that the company could not pay the increase of wages at present, but agree that the question should be reconsidered two months after the Tramways (Temporary Increase of Charges) Bill receives the Royal Assent."

The sub-committee's recommendation was confirmed by the District Council on May 17, 1920.

AREA C.—LANCASHIRE, CHESHIRE, AND NORTH WALES.

This Council has adopted a grading scheme, including the towns mentioned below, as follows—

(1) *Three-farthings per Hour on Basic Rates.*—Barrow-in-Furness, Bolton, Birkenhead, Blackpool, Burnley, Liverpool, Manchester, Oldham, Salford, Stockport, Wallasey, Wigan, Bury, South Lancashire Tramways Company, St. Helens, and Rochdale; and Ashton-under-Lyne as follows—

(*a*) Men working on the Manchester section, ¾d. advance on basic rates.

(*b*) Men on other sections, ½d. advance on basic rates.

(2) *Halfpenny per Hour on Basic Rates.*—Accrington, Blackburn, Middleton Electric Traction Company, Oldham, Ashton and Hyde, Preston, Rawtenstall, Southport, Stalybridge, and Warrington.

(3) *One Farthing per Hour on Basic Rates.*—Blackpool, St. Annes and Lytham Company, Chester, Darwen, and Nelson.

Subject to the following conditions—

(1) Any Corporation or company shall have the right to appeal to the District Council to be placed in a lower grade.

(2) The employees of any Corporation or company shall have the right to appeal to the District Council to be placed in a higher grade.

(3) If any Corporation or company shall be agreeable to be placed in a higher grade than stated above, they shall be allowed to pay the increased amount after submitting the same to the District Council for approval.

(4) All increases to date from March 29, 1920.

(5) In the cases of Glossop and Colne, having appealed to the National Council against the award of 5s. per week from March 29 and 1s. from June 1, no recommendation is made until their appeals have been dealt with.

[N.B.—The Corporation of Colne have withdrawn their appeal.]

(6) This Council agrees to Manchester and Salford paying an increase of ¾d. per hour on the basic rates as per the agreement arrived at by the Manchester Corporation and the Union.

AREA D.—YORKSHIRE, LINCOLNSHIRE, AND NORTH DERBYSHIRE.

At a meeting on May 4th, after the employees had declared that they were prepared to accept the principle of differentiation, the employers proposed a division into four groups—

Group 1.—Hull and Bradford, an increase of 1d. per hour on the basic rates.

Group 2.—Sheffield, Leeds, and Huddersfield, an increase of ½d. per hour on the basic rate.

Group 3.—Halifax, Doncaster, Chesterfield, Lincoln, York, and Barnsley, an increase of ½d. per hour on the basic rate.

Group 4.—Wakefield, the Yorkshire Woollen District Electric Tramways, Keighley, Rotherham, Mexborough and Swinton, Dewsbury and Ossett, and Great Grimsby Street Tramways Company, no increase recommended.

Proposal by the Employees.—"That there should be only two groups, group 1 to have an increase of 1d. per hour; Group 2 to have an increase of ¾d. per hour; and that the groups should be as follows—Group 1 should contain groups 1 and 2 suggested by the employers; Group 2. should contain Group 4 suggested by the employers; and they were prepared to discuss as to whether the towns mentioned in Group 3 by the employers should be put in group 1 or 2."

Further Proposal by the Employers.—"That the groups should be as before, in four classes; that Huddersfield should be included in Group 1, and that the rate of increase should be—Per hour on basic rate—Group 1, 1d.; Group 2, ¾d.; Group 3, ½d.; Group 4, ¼d."

After discussion, it was finally agreed that the recommendations be sent from either side to the National Council for their decision.

E.—SOUTH WALES AREA.

At a meeting on April 8.—

"That the District Council resolve to recommend the National Council to increase the basic wage to tramway workers affected by the recent award, 18 years and over, in the South Wales area, at the rate of 3s. per week from the first full pay-day after March 29 last. The additional 1s. taking effect from June 1 mentioned in the award being merged in the 3s. The aforementioned increase to be taken into consideration and merged in any award that might result from the general national negotiations now pending."

The employees' side retired to consider this proposal separately, and when they returned they agreed to accept same if the employers' side would agree to the date being March 4 instead of the 29. This was agreed to by the employers' side, and the motion as amended was unanimously carried.

F.—MIDLANDS AREA.

At a meeting on April 19 the following resolution was carried unanimously—

"That it be a recommendation to the National Council that an additional ¾d. per hour on basic rates be granted to employees over 18 years of age, the same to become operative as from March 29, 1920."

On May 4 it was resolved—

"That this Council ratifies the decision arrived at on April 19 with regard to the undertakings other than (1) Northampton, (2) Burton-on-Trent, (3) Kidderminster, (4) Worcester, to pay an

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increase of ¾d. per hour on the basic rate, and that a sub-committee of this Council be appointed to examine the financial position of the four undertakings mentioned, and report to the next meeting of the Council. Failing agreement, the question to be referred to the National Council."

On May 27 it was agreed as follows—

(1) That the Burton Corporation and the Worcester Electric Traction Company, Limited, increase their present basic rates by ½d. per hour as from March 29, 1920. (2) The Northampton Corporation have agreed to increase the basic rate by ¾d. per hour. (3) That the following arrangement, made between the Union and the Kidderminster and District Electric Traction Company, be ratified, namely—

For Drivers.—One farthing per hour as from March 29, 1920, with the further ¼d. in June as per resolution of National Council of March 31.

For Conductors.—One halfpenny per hour as from March 29, and a further ¼d. in June.

The meeting was notified that the following companies had withdrawn from the District Council—Notts and Derbyshire Trams Company, Leamington and Warwick Electric Company, Mansfield and District Tramways, Limited, Ilkeston Tramways.

[N.B.—The foregoing modified the decision of the Midlands District Council of April 19, which was ratified by the National Council on April 23.]

G.—Metropolitan Area.

At a meeting on May 5—

Employers' Proposal.—"That no increase be made in the basic rate at the present time, but that the additional war wage of 1s. to be paid as from June 1, 1920, awarded to the employees 18 years of age and over, under the agreement arrived at by the National Council dated March 30, 1920, be increased by 2s., making an additional sum payable from that date 3s. per week, or a total war wage to employees, 18 years of age and over, covered by this agreement, equal to 42s. per week."

Employees' Proposal.—"That this Council recommend an increase of 4s. to the amount granted on March 30 to all employees over 18 years of age, and to those under 18 years of age 2s. per week to operate from March 29, 1920."

The employers' side retired, and on returning intimated that they could not agree to increase the amount they had offered, namely, 2s., but were prepared to recommend that the increase date from March 29.

The employees stated that they were prepared to recommend their members to accept the offer if a shilling was added to the increase of 1s. due on June 1, 1920, under the agreement, making 9s. in all.

No decision was arrived at. The District Council met again on May 12, and failed to arrive at an agreement.

H.—South-west and Part of South Coast Area.

A meeting was held on April 20, when the following proposals were submitted, but no decision was reached.

Employees' Proposal.—"That the District Council recommends the National Council to increase present existing basic rates by 1d. per hour for all employees 18 years of age and over, and ½d. per hour for those under 18 years of age."

Employers' Proposal.—"That the Council, after consideration of the question of basic rates in this area, cannot recommend any alterations, and is strongly of the opinion that no advance beyond that granted by the agreement of the National Council, arrived at so recently as March 31, is called for, whether by increasing basic rates or otherwise."

I.—East, South-east, and Part of South Coast Area.

On May 12 it was resolved—

"That a special sub-committee be appointed, consisting of four members of the general committee, to meet at an early date to consider and classify the undertakings in this area. That each undertaking should submit to the sub-committee any further facts which they may possess to enable their undertakings to be classified, and the special committee to report and make recommendations to the general committee not later than the 27th inst."

Report of Sub-Committee of May 20 and District Council of May 27.

The following decision was arrived at for employees over 18 years of age—

Grade I.—Three-farthings per hour on basic rate, Bournemouth and Portsmouth.

Grade 2.—Halfpenny per hour, Brighton, Southampton, Reading, and Southend-on-Sea.

Grade 3.—One farthing per hour, Norwich, Gravesend, Maidstone, Luton, Lowestoft, Great Yarmouth, Gosport and Fareham, Portsdown and Horndean.

[No increase in Hastings and Peterborough. Ipswich deferred pending result of appeal to National Council against award of March 31. Chatham, Dover, Isle of Thanet, and Colchester, no recommendation, not being represented on the District Council.]

The employers recommend the increases to take effect as from June 1, 1920.

The employees are of opinion that the date should be left to the decision of the National Council.

In opening the proceedings, the chairman (Mr. Hirst) expressed his own disappointment with the proceedings of the District Councils.

Mr. Cliff, for the employees, said that the reference to the District Councils had been a failure; that District settlements were unsatisfactory; and that the only satisfactory solution would be a national one.

Mr. Hamilton, for the employers, replied that differentiation was essential to meet the necessities of the various undertakings concerned, and pointed out that national action had been discredited by the several strikes that followed the agreement of March 31 last.

A long discussion followed, during which Mr. Hamilton inquired—Is it the decision of the employees' representatives that the principle of differentiation should not be acted upon, and that only a flat rate national advance can be agreed upon by this Council? Mr. Cliff answered that they were prepared to admit the same measure of differentiation as was expressed in the March agreement.

Mr. Fearnley moved and Mr. Smith seconded—That the decisions arrived at by the following District Councils be ratified, viz., (1) Northern area; (2) Lancashire, Cheshire, and North Wales area; (3) Midlands area; (4) East and South-east, etc., area;

The voting was as follows—*For*—All the employers and 5 employees. *Against*—Five employees.

The chairman declared that the proposal was not carried.

The Council then adjourned to enable the employees to confer, and on resuming,

Mr. Hirst said that the employees were willing to consider the cases in which no decisions had been arrived at.

Mr. Hamilton then moved, and Mr. Fisher seconded—

"That the District Council for Scotland be authorised to proceed to an arbitration for the authorities within their area; such arbitration to be held in Scotland."

As an amendment, Mr. Cliff moved, and Mr. Black seconded—

"That this Council agrees to grant an increase of ¾d. per hour or 3s. per week on basic rates for the District Council for Scotland to all employees concerned over 18 years of age, with an appeal to the District Council by any authority similar to that named in the proceedings of the District Council for the Northern area."

After discussion, it was agreed to defer the consideration of the Scottish area cases.

The Council adjourned to enable separate conferences to be held.

Subsequently Mr. Hamilton moved, and Mr. England seconded, that the authorities in the area of the Yorkshire, etc., District Council should be grouped into three classes, and that increases on the basic rates be granted to each group as follows:—No. 1 Group, ¾d.; No. 2 Group, ½d.; No. 3 Group, ¼d.; with liberty by both employers and employed to appeal for transfer to another group, that the classification of them into groups be remitted to the District Council, and that failing agreement they be referred to arbitration.

In proposing the resolution, Mr. Hamilton intimated that he would probably be able to submit a similar proposal for the Metropolitan and South-west, etc., areas.

After separate conferences, Mr. Cliff announced that the proposal must include Scotland and exclude the Metropolitan area; for the last-named they could not agree to anything but a flat rate. He claimed that, by allowing three groups for Scotland, they were in effect granting arbitration to that District Council in accordance with the request of the employers.

After further discussion, Mr. Hamilton said that the employers could not agree to that course.

No decision was arrived at, and the meeting terminated at 6.45 p.m.

J. Beckett, Joint Secretary.

Meeting on June 2.

In view of the failure of the National Joint Industrial Council for the Tramway Industry to arrive at a decision at the meeting held on May 28, a subsequent meeting was convened on June 2 at the request of the Minister of Labour. There were present for the employers—

Mr. W. J. Squires (in the chair), Sir John Courtis, Kt., the Mayor of Portsmouth (Councillor Timpson), Alderman Brown (Leeds), Alderman Craddock (Wolverhampton), Alderman Wylie (South Shields), Councillor Higham (Blackburn), and Messrs. T. B. Goodyer, J. B. Hamilton, Peter Fisher, E. H. Edwardes, C. R. Tattam, W. G. Verdon-Smith, C. J. Spencer, R. J. Howley, and E. Garcke; and for the employees, Messrs. S. Hirst, N. Bradwell, H. Allen, J. W. Eccles, E. H. Bawden, W. Dakin, R. Powell, C. Tilling, E. Smith, E. H. Davis, J. W. Stark, W. Anderson, G. Beasley, D. Paterson, G. Black, J. W. Duncliff, A. Tackley; and the joint secretaries, J. Beckett, Municipal Tramways Association; J. Cliff, Vehicle Workers' Union; and A. de Turckheim, Tramways and Light Railways Association.

Sir David Shackleton, who represented the Ministry of Labour, explained that since the previous meeting he had seen some representatives of both sides of the Council, and had considered the reports prepared by his staff upon the proceedings of the last meeting. There was some evidence of a wish to arrive at an agreeable settlement.

Mr. Cliff then submitted the following proposals with respect to

(A) Scotland, (B) Yorkshire District Council, (H) South-west District Council, (I) South-east District Council.

That the tramway undertaking covered by each of the aforementioned Councils be graded into three separate groups by the District Councils concerned; that a general increase of ¾d. per hour on the basic rate be made by No. 1 group; that a general increase of ½d. per hour on the basic rate be made by No. 2 group; and that

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a general increase of ¼d. per hour on basic rates be made by No. 3 group. These increases to apply to all employees aged 18 years and over covered by the agreement of this Council dated March 31, the increases granted to operate from March 29, 1920.

Should a difference arise on any District Council in the allocation of the undertaking into their respective groups, such difference be referred to the National Council for settlement.

The District Councils concerned to be requested to meet not later than June 16, 1920.

G.—Metropolitan District Council.

That a general increase of 3s. per week be made to all employees aged 18 years and over, who are covered by the agreement of this Council dated March 31, 1920. The increase to operate from March 29, 1920.

B.—Northern District Council, C.—Lancashire and Cheshire District Council, F.—Midland District Council.

That the decisions of the aforementioned Councils on the reference of this Council of April 23, 1920, be endorsed.

Note.—In the proposals submitted by the Yorkshire District Council it is proposed to pay the employees on certain undertakings the sum of 1d. per hour increase on the basic rate, nothing in this agreement shall prejudice the right of an undertaking to voluntarily pay a higher figure than that contained in the agreement. Any proposed variations shall be reported to the District Council for confirmation.

In the general discussion which followed, Sir David expressed the opinion that the Council could not be asked to sanction rates of increase beyond those agreed to, and that a serious attempt would be made to reach an agreement.

The Council then adjourned, and on resuming, Mr. Spencer, for the employers, suggested the following alterations in Mr. Cliff's proposal—(1) To transfer South-east District Council from the first to the third proposal; (2) to delete the second proposal, and to place the Metropolitan District Council under the first proposal; (3) to delete the note.

A discussion ensued, after which the representatives of the Metropolitan area retired to confer. Upon resuming, the employers intimated that they were prepared to recommend the acceptance of proposal No. 2.

After further discussion, the following decisions, proposed by Mr. Cliff, and seconded by Mr. Spencer, were arrived at—

A—Scotland District Council, D.—Yorkshire, etc., District Council, H.—South-west, etc., District Council.

That the tramway undertakings covered by each of the aforementioned Councils be classified into three groups by the District Councils concerned; that a general increase of ¾d. per hour on the basic rate be made to No. 1 group, ½d. to No. 2 group, and ¼d. to No. 3 group; the increases to apply to all employees aged 18 years and over covered by the agreement of this Council dated March 31, 1920, such increase to operate from March 29, 1920.

Right of Appeal.

That any Corporation or company shall have the right to appeal against their classification.

That the employees of any Corporation or company shall have the right to appeal against their classification.

That if any Corporation or company shall be agreeable to be placed in a higher grade than stated above, they shall be allowed to pay the higher amount after submitting the same to the District Council for their approval.

That a sub-committee of four from each side shall be appointed to hear appeals. Should a difference arise on any District Council in the classification of the undertakings into their respective groups, such difference shall be referred to this Council for settlement.

The District Councils concerned to be requested to meet as early as possible, and not later than June 16, 1920.

Note.—Mr. Peter Fisher requested that it be placed on record that he dissented from this proposal.

It was proposed by Mr. Cliff, seconded by Alderman Wylie, and resolved—

G.—Metropolitan District Council.

That a general increase of 3s. per week upon the basic rate be made to all employees aged 18 years and over who are covered by the agreement of this Council of March 31, 1920, such increase to operate from March 29, 1920.

B.—Northern District Council, C.—Lancashire District Council, F.—Midlands District Council, I.—South-east District Council.

That the decisions of the afore-mentioned District Councils on the reference to them from this Council of April 23, 1920, now submitted, be ratified.

H.—It was resolved that the South-Eastern, etc., District Council be informed that the increases granted date from March 29, in accordance with the undertaking made by the employers at a previous meeting.

FINANCIAL REPORTS AND MEETINGS.

Brazilian Traction Company, Limited.—The usual quarterly dividend of 1½ per cent. on the preference shares has been declared.

Yorkshire (West Riding) Electric Tramways.—An interim dividend of 3 per cent. on the 6 per cent. cumulative preference shares has been announced.

Dublin and Lucan Electric Railway.—A dividend of 5s. per share will be paid on the 5 per cent. preference shares for the year ended December 31, 1919.

Electric Construction Company, Limited.—A final dividend is announced at the rate of 6 per cent. on the ordinary shares, making 7 per cent. for the year; also a bonus of 2½ per cent. on the ordinary shares, both subject to tax.

Anglo-Argentine Tramways.—The directors recommend the payment of a dividend of 5s. 6d. per share, less tax, on the 5½ per cent. cumulative preference shares, being twelve months' arrears to June 30, 1918, payable on July 1.

Reading Corporation Tramways.—The Tramways Committee report a deficit on the year's working of £6,787, which compares with a profit of £5,061 a year ago. This is the first occasion in the history of the undertaking when there has been a deficit on working.

Estimated Deficit on Burton Tramways.—It is reported that the tramway estimates about to be submitted to the Burton-on-Trent Corporation will show a heavy deficit, which will have to be met either by increased fares or a substantial assistance from the rates.

The Dudley, Stourbridge and District Electric Traction Company, Limited.—A dividend has been declared of 4 per cent. on the ordinary shares for the year ended December 31 last. After allocating £2,000 to renewals, and £1,000 to the reserve fund, a balance of £65 is carried forward.

Derby Corporation Tramways.—At a meeting of the Derby Tramways Committee it was announced that fares would certainly have to be increased to meet the estimated deficit this year. With receipts estimated at £106,000, the expenditure is up to £123,000, including £58,584 for wages, £24,000 for repairs and materials, or a total deficit of £17,057.

Bury Corporation Tramways.—Alderman T. S. Collinge, chairman of the Tramways Committee, stated to the Bury Town Council on May 6, that the net profits on the tramways for the past financial year were £5,375, against £8,375 in the previous year. The profits are being carried to the reserve fund. This is the first time for fifteen years that no payment is being made to the rates, but, owing to the increasing cost of permanent way and rolling stock renewal, it has been felt necessary to build up the reserve fund.

Oldham, Ashton and Hyde Electric Tramways, Limited.—The accounts for the year to December 31 show an increase in revenue of £8,400 at £59,100, but expenditure, including debenture interest, absorbs £9,300 more, at £42,600, than at the corresponding period a year ago. The dividend is maintained at 6 per cent. on ordinary shares, and £10,000 is again transferred to reserve, the amount carried forward, at £6,000, being £1,000 more than the sum brought in. It is stated that all the local authorities in whose areas the lines are situated have given notice of intention to purchase the undertaking within their respective areas, and that the arbitration to determine the price to be paid to the company is expected to take place shortly.

Leeds City Tramways.—At a meeting of the Leeds Tramways Committee a draft statement of the income and expenditure for the year ended March 31 last was adopted and a vote of thanks was accorded to the general manager (Mr. J. B. Hamilton) and his staff for the result of their year's work. The accounts show a net surplus for the year of £83,757. The income for the year totalled £876,526. Traffic expenses increased by £90,846; but the heaviest additional charge came under the item "Wages of motormen and conductors," where the total has risen from £141,515 in 1918-19 to £204,483 last year. Parcels traffic shows a very large expansion, the number of parcels having increased from 39,032 in 1919, the first year of the experiment, to 144,644.

Rothesay Tramways Company, Limited.—The report for the year ended December 31, 1919, to be submitted to the shareholders at the meeting on May 27, shows that the total receipts amounted to £19,294. After meeting all expenses, including £1,512 for debenture and other interest, £1,000 for the renewal fund, and writing off £1,000 from discount and commission in respect of the issue of debentures, there is, including the sum of £458 brought forward, a balance of £5,645. The directors recommend that this sum should be appropriated as follows:—Dividend at 3 per cent. on the ordinary shares, £2,453; 5 per cent. on the preference shares, £500; reserve, £1,000; balance forward, £1,692. The directors refer with deep regret to the death of Mr. A. C. Miles, who had been chairman of the company for many years. Mr. W. L. Madgen has been appointed chairman.

Blackpool Corporation Tramways.—Mr. Charles Furness, general manager of Blackpool Corporation tramways, presented the

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annual return of the working of the tramways to the Tramways Committee on May 19. The income for the year ended March 31 last was £186,475, compared with £140,929 in the previous year. Expenses totalled £147,770, compared with £90,033. The disposable balance is £15,583, against £30,052. Referring to the taking over of the Blackpool and Fleetwood Tramroad Company's undertaking, Mr. Furness stated that the cost was as follows: Purchase price, £235,000; compensation to the manager and directors, £14,000; debentures taken over by the Corporation, £35,000; Treasury Bills payable to the company, £13,758 7s. 1d.; stamp duty, £2,840; legal and Parliamentary expenses, £2,111 11s. 9d.; a total of £302,709 18s. 10d. less credits of £38,887 3s. 6d.

YARMOUTH CORPORATION TRAMWAYS.—The borough accountant, reporting on the finances of the Yarmouth Corporation tramways for the past year, said that the gross working profit was £8,322, as compared with £4,207 for the previous year. The traffic receipts had increased by £18,225, but the expenditure had increased by £17,113 to £33,902. A balance was brought forward from 1919 of £586, and £308 was received for interest on cash balances. Interest and sinking fund payments required £8,471 and the balance of £745 was carried forward. Mr. J. Salmon, chairman of the Tramways Committee, said that the balance was absolutely useless for such an undertaking. They required at least £2,000 for renewals. During the past year £8,268 had been spent on repairs, yet the track was in such a deplorable state that they would not allow a company to run their cars under such conditions.

BRISTOL TRAMWAYS COMPANY.

Mr. Samuel White, chairman of the Bristol Tramways and Carriage Company, Limited, presided at the annual meeting held in Bristol. In moving the adoption of the report, Mr. White explained the omission of the name of Mr. Challenger in the list of directors given in the report. This was accounted for by a legal technicality. Although Mr. Challenger had been their colleague for some months past, until the requisite alteration of their articles was made by them that day he was not legally entitled to act. As a matter of fact some months had elapsed since Mr. Challenger, after five years of the most strenuous work, desired to be relieved from the stress. On Mr. Sydney Smith's return he had had the opportunity of taking a little easier turn, resulting in the improvement of his health. They welcomed the return of his assistant, Col. Sydney Smith, who from August, 1914, had been devoting his experience and organising ability to the service of the Government at home and abroad. Speaking of the war work in which the company had been engaged as sub-contractors of the British and Colonial Aeroplane Company, he said it was war work without compare in the tramway industry of the country. Since they had given up that work they had turned all their energy to making up leeway and putting the rolling stock into a satisfactory position. They were now giving a service of cars 20 per cent. in excess of pre-war times; in fact the number of passengers carried on their cars and omnibuses was 72,838,076, an increase over the previous year of 11,024,952. The revenue of the tramways was £341,857, an increase of £56,992. In the carriage department it was £488,879, an increase of £36,142. The figures were the largest they ever had to record. As to expenses, it was almost useless to treat the figures as comparable with those of the year before, as the work they had been doing had been changing. For traffic alone the wages last year were £267,622, an increase of £96,892, or 31½ per cent. Coal, petrol, and traffic sundries had increased to £136,573, an increase of £24,544. Rates and taxes showed an advance of £24,690. The total under the heading of renewal, repairs, and maintenance was £231,901. In the previous year they had only spent £23,190 on repairs, renewal, and maintenance, but £50,000 had been set aside in preceding years under this head. They had spent £281,000, compared with £240,000 in the previous year, and they had a balance of net revenue of £75,619 to carry down for appropriation. With the single exception of Glasgow they were the only tramway undertaking in the kingdom who had continued to carry the public at the pre-war rates. They would presently have to increase their tariff so that no fare would be less than 50 per cent. greater than to-day. The net revenue showed a balance of £90,000, and after meeting outgoing and interim dividends they had £32,000 for disposal. They proposed to pay a final dividend of 4 per cent. free of income-tax, and to carry forward £12,257. They would thus pay a dividend for the year of 7 per cent., free of income-tax. Mr. J. H. Howell seconded, and Mr. Challenger acknowledged the kind remarks made about him by the chairman, stating that in May last he completed 40 years as manager of tramways, 37 of which had been with the Bristol company. He recalled the development in that period, acknowledging the generous treatment of the directors on his retirement from the position of general manager, and expressed his pleasure that Col. Smith was succeeding him after 20 years as assistant Manager. An extraordinary meeting followed at which the resolution was passed altering the company's Articles of Association to increase the number of directors to six, so as to provide for Mr. Challenger's appointment.

GLASGOW TRAMWAYS YEAR.

The financial year for all Glasgow Corporation departments closed on May 31. The following are the traffic, etc., statistics for the tramways department—

Average track mileage open during year 196½

	Total.	Increase.
Car mileage	26,459,015	877,468
Traffic receipts	£1,716,490 16s. 8d.	£189,003 0s. 3d.
Traffic receipts per car mile	15·570d.	1·239d.
Traffic receipts per passenger	·809d.	·019d.
Passengers carried ...	509,339,886	45,093,209
Passengers carried per car-mile	19,250	1,102

The following statement gives the number of passengers carried at each fare—

	Year to May 31, 1920.	Per-centage.	Year to May 31, 1919.	Per-centage.
½d.	304,865,756	59·86	290,080,376	62·48
1d.	142,076,326	27·89	121,285,355	26·12
1½d.	37,989,011	7·46	31,750,977	6·84
2d.	12,394,898	2·43	10,348,905	2·23
2½d.	5,596,692	1·10	4,846,252	1·05
3d.	2,732,362	·54	2,520,384	·54
3½d.	2,650,163	·52	2,952,145	·64
4d.	1,034,678	·20	462,283	·10
	509,339,886	100·00	464,246,677	100·00

The weight of copper received during the year amounted to 813½ tons, and the weight of silver 145½ tons.

Since July 1, 1894, to May 31, 1920, the total of passengers carried at each fare, with percentages, are as under—

		Percentage.
½d.*	2,979,537,218	47·98
1d.	2,572,708,774	41·43
1½d.	423,286,102	6·82
2d.	135,126,497	2·17
2½d.	47,316,898	·76
3d. and upwards	52,171,581	·84
	6,210,147,070	100·00

* Includes old two-stage tickets.

The miles run aggregated 465,094,090, and the traffic revenue £21,954,080 9s. 3d.

LONDON TRAFFIC REPORT.

STILL UNDER CONSIDERATION.

In reply to Mr. Newbould, who asked whether the Government had arrived at any decision with regard to the report of the London Traffic Committee, Mr. Neal, Parliamentary secretary to the Ministry of Transport, stated in the House of Commons on June 1 that the authorities and owners of undertakings concerned with London traffic were pressing on with such improvements to the service as were possible, and he hoped that before winter a considerable improvement would have been effected. The report of the Advisory Committee on London Traffic, which made recommendations with a view to the future control of London traffic, was still under consideration by the Cabinet.

Mr. Foreman further asked whether in considering the legislation for the remainder of the session regard would be given to the urgent need in reference to London traffic.

Mr. Bonar Law.—The answer is in the affirmative, but complicated questions are involved in regard to finance and the relationship of the London Traffic Authority to the Departments of State and to the local authorities.

RELAYING SETTS AFTER FORTY YEARS' WEAR.—Holborn Borough Council are removing the stone setts from Lincolns Inn Fields, relaying them after re-dressing in Clerkenwell. The paving has been down for forty years, and the setts are now valued at 8d. each.

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PERSONAL.

Mr. H. Richardson, city electrical engineer of Dundee, has been voted an increase in salary from £1,000 to £1,150 per annum.

Mr. C. M. Hefford, city electrical engineer of Leeds, has been granted an increase in salary from £1,260 to £1,500 per annum.

Mr. J. S. Austen has been appointed a director of the British Electric Traction Company, Limited, in succession to Mr. C. Jermyn Ford, who has resigned.

Mr. Bdgar S. Barralet, who for many years has been associated with Pinchin, Johnson and Company, Limited, has been appointed a director of that company.

Mr. T. Gordon, J.P., of Blackpool, has forwarded to Accrington Town Council £400, the balance required to erect a new tramway shelter which he promised to the town. The whole cost of the shelter will be £450.

Mr. Charles Burgess, engineer and general manager of West Hartlepool Corporation tramways, has been appointed general manager of Walsall Corporation tramways, at a salary of £700 per annum, rising by annual increments of £50 to £900.

Mr. Ernest Morgan has been selected out of more than one hundred applicants for the position of technical and engineering assistant to the chief engineer and general manager of the Wolverhampton Corporation Electricity Department. For the past ten years Mr. Morgan has been in the service of the Yorkshire Electric Power Company, recently as operation engineer.

Mr. Richard Hoggard, who has recently been appointed to the position of traffic superintendent of the Wigan Corporation tramways, has been in the service of Sheffield Corporation tramways for twenty years, and at the time of his appointment to Wigan he was assistant traffic superintendent. On May 14 he was presented with an illuminated address, a china display cabinet and other gifts from his fellow employees at Sheffield.

Sir Arthur Currie has accepted the Principalship of McGill University, the leading institution for the training of engineers in Canada. Sir Auckland Geddes, the British Ambassador at Washington, whom Sir Arthur Currie succeeds, writing to the Governors of McGill, said that the position which Sir Arthur Currie must ever hold in the minds of all who went from Canada to serve in the Great War makes him the best man who could be found for that important post.

Exeter Council's Compliment to the Tramways Manager.—At a meeting of the Exeter City Council on May 18, the Mayor said that the show of the Devon County Agricultural Association, which was held recently in the city, had been one of the most successful in the history of the Association. The tramway arrangements for conveying such a large number of people had been exceptionally good. On the motion of the Mayor, the Council recorded their appreciation of the work of the Chief Constable and his staff and of Mr. O. H. Baldwin, the general manager of the tramways, and his staff.

Presentation to Mr. Arthur Ellis.—Cardiff tramway men have presented Mr. Arthur Ellis, who resigned the position of engineer and general manager at the end of last year, with a silver inkstand subscribed for by the drivers, conductors, and other employees. Mr. F. White, one of the oldest drivers in the service, made the presentation, and Mr. A. J. Atwell, on behalf of the employees, presented Mrs. Ellis with a silver clock. In expressing his appreciation of the gifts, Mr. Ellis said that if all branches of labour worked as harmoniously as Cardiff tramway employees did the question of wages, etc., would not be so difficult as they are now.

Mr. Walter T. Young, traffic superintendent of Edinburgh Corporation tramways, has been appointed general manager of Dundee Corporation tramways at a commencing salary of £600. He will take up his duties on July 1. Mr. Young has had twenty-two years' experience of tramway work. He was fourteen years at Aberdeen, resigning the position of traffic manager there to go to Oldham, where he was traffic superintendent for two and a half years, and later he became traffic superintendent of West Ham tramways. Leaving West Ham, he was for a year at Belfast, as traffic superintendent, and he has since been connected with Edinburgh Corporation tramways.

Mr. J. S. Badger has resigned the office of resident engineer and general manager of the Brisbane Electric Tramways Company, Limited, on account of failing health. In making the announcement at the annual meeting of the company, Mr. H. R. Beeton, the chairman, said that Mr. Badger had been entirely devoted to the interests of the company, and the necessity for his resignation was a matter of extreme regret to him at this critical juncture in the company's affairs. In Mr. Stephens, the present manager, and his assistants they had very able and devoted officials, but in the circumstances prevailing the board had thought it advisable to appoint a local board. A resolution expressing deep gratitude to Mr. Badger for his long and conspicuous services to the company, and hopes for his speedy recovery, was unanimously passed.

TRAMWAY AND LIGHT RAILWAY NOTES.

BIRMINGHAM.

Opening of New Route.

The official inspection of the new tramway route of Birmingham Corporation along Salford Bridge Road to Gravelly Hill was made on May 14 by Colonel Pringle, on behalf of the Ministry of Transport. The new route, which extends from Litchfield Road to Fort Dunlop, is two miles in length and the tracks are laid on the sleeper system. Colonel Pringle expressed himself satisfied with the work, and the certificate of the Ministry was received and the line opened.

BOURNEMOUTH.

Progress of the Tramway Department—Strike of Workmen.

Bournemouth Town Council at a recent meeting expressed their high appreciation of the services of Mr. I. Bulfin, general manager and engineer of the Corporation tramways, and of his efficient conduct of the undertaking during another difficult and strenuous year. The *Bournemouth Times* remarks that the thanks are well deserved. The position of the tramways, as shown by the figures in Mr. Bulfin's last report, may, it adds, be regarded as "a revelation which is truly amazing when one recollects the timid prognostications with regard to the tramways which were common a few years ago." Notwithstanding a very large increase in traffic, there has been a complete freedom from any serious accidents during the year. The strike of 150 men employed in the reconstruction of Bournemouth tramway tracks continues. The men were receiving 1s. 2½d. per hour and have refused an offer of 1s. 4d. for labourers and 1s. 5d. for hammermen. The workers' union organisers agreed that the men should return to work on Monday last and that the matter should be submitted to the Ministry of Labour for arbitration, but the men refused to carry out the arrangement. Their contention is that their work is as skilled as that of builders' labourers, who are receiving 1s. 9d. per hour.

COLCHESTER.

Theft of Tramway Tickets.

A conductor on the Colchester Corporation Tramways has been sentenced to two months' hard labour for stealing 600 tramway tickets of the value of £5. A ticket clerk, in giving evidence, said that between March 1 and 15 tickets were missed from the boxes of other conductors. The chief clerk at the depot stated that the figures on the defendant's way bills had been raised, and the defendant admitted that he took the tickets and sold them.

EXETER

At a meeting of the Exeter City Council on May 18, the Mayor said that the show of the Devon County Agricultural Association which has just been held in the city, had been one of the most successful in the history of the Association. The tramway arrangements for conveying such a large number of people had been exceptionally good. On the motion of the Mayor, the Council recorded their appreciation of the chief constable and his staff and of Mr. R. O. Baldwin, the general manager of the tramways and his staff for their work.

EDINBURGH.

Cable Breakdown—Aid of Omnibuses—Self-propelled Cars.

Owing to a break of the tramway cable near the corner of St. Andrew Street, on May 7, a considerable part of the tramway traffic of Edinburgh was interrupted from about 8.30 a.m. until noon. The Corporation's motor omnibuses were immediately brought into service, and the inconvenience caused by the stoppage was in this way considerably mitigated. It has been suggested to the Edinburgh Tramways Committee that further inquiries should be made with regard to self-propelled tramway cars.

KEIGHLEY.

Extension of Railless System.

It is hoped very shortly to have the railless cars on the Ingrow Road route running as far as Oxenhope, a distance of 3¾ miles. At present the service on this route extends from the terminus at Ingrow to Lees. The West Riding County Council have for some time objected to the establishment of a service on a portion of the proposed route, but the Ministry of Transport has recently suggested to the Council that they should reconsider the matter, and the latter have now withdrawn their objection. The railless service at Keighley has for some time been discontinued on some of the routes, and recently only one out of nine cars was running.

LEYTON.

Strike at Leyton Tramway Depot.

The strike at the depot of the Leyton District Council Tramways has been settled for the time being, i.e., until the decision of the Industrial Council has been given. The men struck because skilled men were not paid 2s. 3d. an hour and mates 1s. 9d. under an agreement made between the Electrical Trades Union and the National Electricity Federation. The matter was referred to the Joint Industrial Council, and the men were asked to wait the result of their decision, but they refused to continue work. At the end

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of last week, owing to the lack of repairs, a number of cars were unable to leave the shed, and consequently the Council had temporarily to suspend 182 employees.

LIVERPOOL.

A Crusade Against Spitting on Tramcars.

Liverpool Corporation has started a crusade against the practice of spitting on the tramway cars, a number of men having already been fined for the offence. It is stated that owing to the preoccupation of the officials with traffic difficulties incident to the war the infraction of the bye-law has been tolerated, but the officials are now determined to stop this insanitary and disgusting habit. The intention of the Liverpool authorities may be commended to the notice of other undertakings throughout the country.

LONDON.

Fine for Smoking in a Tramcar—Season Tickets—All-Night Tramway Service Extended.

In a prosecution at the Tower Bridge police-court on May 24 a representative of the London County Council stated that smoking inside tramcars was becoming such a habit that the Council felt bound to take notice of flagrant breaches of their bye-law. A man who had refused to desist from smoking when asked by the conductor to do so, and had assaulted the latter for trying to stop him was fined 20s. for smoking inside a car and 20s. for the assault. The London County Council, on the advice of the Highways Committee, which has recently considered the proposal for the introduction of season tickets on the tramways, has decided that the innovation is impracticable. The all-night service of London County Council cars between Blackfriars and Water Lane, Brixton, was extended on May 16 to St. Helen's Church, Streatham. The extended service is to be given a trial for three months.

NOTTINGHAM.

Tramway Employees' Friendly Society.

The balance sheet of the Nottingham Corporation Tramway Employees' Friendly Society shows that its financial position is exceptionally sound. The assets include a loan to the Nottingham Corporation of £7,580, 5 per cent. National War Bonds £1,200, and there is a cash balance at the bank of £952. The society was inaugurated on January 1, 1903, with Mr. John Aldworth, the tramway manager, as chairman, and Mr. A. Jackson, secretary. These gentlemen have been present at every meeting held during the past seventeen years.

OLDHAM.

Purchase of Oldham, Ashton and Hyde Tramways.

It is reported that some dissatisfaction is felt at the delay in the arbitration proceedings in connection with the purchase by the four local authorities concerned of the Oldham, Ashton and Hyde Tramway Company's undertaking. The twenty-one years' lease on which the company took over the lines expired on August 7, 1917. At that time Hyde Corporation gave notice to purchase, and a similar notice was given by each of the three other public authorities. The Hyde Corporation received sanction to proceed with the purchase in January, 1918.

SHEFFIELD.

Athletic Club for Tramwaymen.

It is proposed to establish an athletic and social club for the employees of Sheffield Corporation Tramways department. An option has been secured on some ground near the city which will provide for tennis, cricket, football, etc. Funds will be raised by weekly contributions from the men.

SUNDERLAND.

New Cars with Front Exits—Employees Ask for Annual Holiday.

Sunderland Corporation is introducing a new type of enclosed car. Six bogie cars are being converted under the direction of the general manager, Mr. A. R. Dayson. The principal feature is the provision of front exits, which will expedite the loading and unloading of the cars. Sunderland Corporation tramway employees have asked for an annual holiday of eight days with pay. The Tramways Committee are making inquiries as to the practice of other tramways in the North before taking any action.

SWANSEA.

Rail Welding.

At a meeting of the Swansea Tramways Committee, the borough engineer reported that a number of rail joints that had been welded by the Rail Welding Company, Limited, were found to be standing satisfactorily. He estimated that there were about 1,800 joints which now required attention, and he submitted a tender from the company for the work. The cost will be borne by the Swansea Tramways and Improvements Company, who are anxious that the work should be carried out at once The Rail Welding Company have undertaken to commence the work almost immediately if the order is placed at once, and the borough engineer was authorised to place the order immediately.

TRAMWAYS AND LIGHT RAILWAYS ASSOCIATION.

ANNUAL CONGRESS.

The announcement was made in the Association's journal for May that the Council has decided again to hold the annual congress in London owing to the difficulties of obtaining accommodation in the provinces. The meeting will take place in the Council Chamber, Caxton Hall, Westminster, on Friday, July 2, when two papers will be read, one by Mr. P. J. Pringle (chief engineer and general manager of the Electric Supply Company of Victoria, Limited), Ballarat, and another by Mr. C. J. Spencer. The annual dinner and smoking concert will be held in the evening at the Connaught Rooms at 7.30 p.m.

The journal for May contains a report by Major G. L. Hall, for the Ministry of Transport, on the accident on the Yorkshire (West Riding) electric tramways which occurred on January 29, and the award of the Industrial Court (222) in a claim for an increase in wages made by the drivers, conductors, and depot employees of the Liverpool Corporation Tramways, under which all employees concerned aged 18 years and over receive an advance of 5s. for a full ordinary week as from February 1.

CONTRACTS AND ORDERS.

Aberdare Town Council has placed the following contracts—Petrol-electric omnibuses, Tilling-Stevens Motors, Limited, £12,875; tramcars, Metropolitan-Vickers Electric Company, Limited, and Brush Electrical Engineering Company, Limited, £25,139; permanent way, G. Percy Trentham and Son, £98,041; car shed extension, G. Warlow and Company, £5,660.

East Ham Highways Committee have recommended the purchase of one 2-ton special chassis by Burford's, Limited, complete with tip and hydraulic tipping gear, at a price of £950. The committee have also considered the question of purchasing a lighter type of vehicle for general cartage work, and suggest that a new 1-ton lorry should be purchased at a cost not exceeding £750.

Salford Electricity Committee have accepted the following tender—Building work in connection with new 5,000 kw. turbo set, Smith and Briggs, Limited, Old Trafford, £3,220; also tenders of the Metropolitan-Vickers Electrical Company, Limited, Manchester, for switchgear and erection, £1,293 12s., equipping cubicle at Trafford sub-station for controlling second feeder to Eccles, £263 14s., e.h.t. switch cubicle for consumers' sub-station, £374 10s.; supply and erection of two 600 k.v.a. transformers in connection with sewage works supply, £2,048.

Replacing of Engines at Hull.—The general manager, Mr. E. S. Rayner, has reported to the Tramways Committee that an engine had broken down at the Osborne Street power-station, and that another 300 kw. engine was unreliable. He has recommended that the present 300 kw. engines be sold, and, if possible, a larger engine be obtained from undertakings who are replacing their engines by turbines. The committee instructed the manager to make inquiries and to report as to the possible disposal of the engines, their replacement by engines of greater capacity, and the probable financial result of the change.

Brighton Tramway Depot Extension.—Tenders for the extension of the car sheds at the Lewes Road depot were invited by the Tramways Committee in December last. Only one tender was received, and this the committee could not accept. They then instructed their tramways manager and engineer, Mr. William Marsh, to obtain separate offers for specific parts of the work. Having considered the offers thus obtained, the committee have recommended that only two-thirds of the scheme should be carried out, and they advise the acceptance of the following tenders—Messrs. Field and Cox, supply and execution of roof covering, erection of steel work, etc., £3,067; Messrs. E. and J. Keay, supply of structural steel work, £1,991; Messrs. Mellowes and Company, patent glazing, £370; total, £5,428.

BUSINESS NOTICES.

The Metropolitan-Vickers Electrical Company, Limited, are moving their London office to 4, Central Buildings, Westminster, London, S.W.1, which will be the address as from June 1.

The Northern Electrical Vehicle Services, Limited, has been registered with a capital of £100,000 in £1 shares, to carry on the business of manufacturers and to act as agents for electrical and mechanically propelled vehicles. The registered offices are at Northumberland Road, Newcastle, and the first directors are Messrs. G. S. Newall, R. S. Barrett, and F. Nicholson.

Buckley, Saunders and Company, Limited (E. A. Chantler) have secured the agencies for South America for the Wild-Barfield electric furnaces, and also for the Argentine for the A.I. Manufacturing Co.'s electric welding machines. Demonstration plants are already erected and working at the works in Buenos Aires, and can be inspected by applying at the offices, 314, Bme. Mitre. A demonstration Wild-Barfield electric furnace will also be in operation shortly in Rio de Janeiro.

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PATENT LIST

Abstracted for "The Tramway and Railway World" from the Official Journal of Patents.

***** If the inventions have been communicated the names of the communicators are given in italics.**

APPLICATIONS FOR LETTERS PATENT.

The number of the patent is given in brackets.

Radiator for motor vehicles (11,606)—P. Bans.
Brakes for motor vehicles (11,472)—G. Davis.
Direction indicators for motor vehicles (11,978)—W. V. Gledhill.
Steering mechanism (11,525)—Goodyear Tire and Rubber Company.
Life-guard for tramcars, etc. (11,788)—F. Hill.
Motor vehicles (11,803)—W. F. Hudson.
Methods of applying motive power to mechanically-driven vehicles (11,595)—A. E. McColl and W. McFarlane.
Radiators for motor vehicles (11,966)—E. G. Morley.
Gear boxes for automobiles (12,090)—W. N. C. Russell.
Rail chairs (11,627)—H. J. Trunks.
Brakes for motor vehicles (12,437 and 12,438)—S. E. Alley.
High frequency signalling systems (12,808)—British Thomson-Houston Company (*General Electric Company*).
Steering control mechanism for motor vehicles (12,685)—G. W. A. Brown and St. George Carriers, Limited.
Steering gear for motor vehicles (12,766)—M. Brown.
Indicator for vehicles (12,574)—G. H. Bruder.
Resiliently mounting chassis of motor vehicles (12,698)—W. Cross.
Tires for motor vehicles (12,503)—Dunlop Rubber Company and A. W. T. Hyde.
Electric tramway safety guard for trolley (12,656)—J. and R. F. Ellis.
Change speed gear for motor vehicles (12,190)—A. Gnudi.
Lifting jacks (12,413)—W. James.
Flexible transmission for axles of power-driven vehicles (12,428)—G. Rodwell.
Drive or transmission of motor cars (12,729)—A. G. Sanders.
Brakes for automobiles (12,637)—R. Schmitz.
Electric vehicles (12,480)—R. Slaby.
Producer gas plant for motor vehicles (12,188)—C. J. Waldie.
Fluid pressure braking apparatus (12,721)—Westinghouse Brake Company.
Motor vehicles (12,318)—W. J. Young.
Means for transmitting electric current to electrically-driven motor vehicles (12,754)—C. G. L. Judge.
Electrical contact makers for steering wheels of motor vehicles (12,522 and 12,523)—J. L. Scott.
Indicating devices for vehicles (13,181)—W. Adams and F. J. H. B. Hutchinson.
Means for warming radiators of motor cars (13,162)—P. Elphick.
Automobile engines (12,898)—J. J. J. M. Kluytmans.

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Power transmission devices for self-propelled vehicles (13,434)—F. T. Skippins.
Tramway rails (12,928)—J. F. Webb.
Means for preventing skidding of motor vehicle wheels (12,876)—E. H. Kinnard.
Device for indicating proposed stopping or turning of motor, etc., vehicles (13,892)—A. E. Burt and G. Mott.
Brake actuating mechanism for motor vehicles (13,514)—Daimler Company, T. Dawson and J. Dixon.
Lubricating devices for motor vehicles (14,123)—J. Y. Johnson (*P. Evans*).
Transmission and brake mechanism of power-propelled vehicles (13,974)—F. W. Lanchester.
Steering mechanism of power-propelled vehicles (13,975)—F. W. Lanchester.
Motor vehicles (14,040 and 14,041)—Maybach-Motorenbau Ges.
Compressed air lifting jack (13,678)—A. Michel.
Devices for reducing air resistance on motor vehicles (13,920)—C. T. Myers.
Device for loading and unloading passengers on tramcars (13,787)—P. A. Purton.
Road traffic signalling systems (14,087)—C. Thorpe.
Traffic indicators (13,804)—H. E. Warr.
Road wheels for motor vehicles (14,454)—D. V. Austin.
Starting devices for motor vehicles (14,536)—A. E., C. and W. Benson.
Power transmission gears for motor vehicles (14,250)—G. Borrett.

SPECIFICATIONS PUBLISHED

1918

Signalling apparatus (14,567—*141,764*)—British Thomson-Houston Company (*General Electric Company*).
Fluid pressure braking apparatus (19,142—*141,767*)—A. W. Rendell.

1919

Retaining road wheels on live axle motor vehicles (3,796—*140,879*)—J. I. Thornycroft and Company and T. Thornycroft.
Friction driving gear for motor vehicles (15,517—*140,945*)—R. Blakoe.
Variable gears for motor vehicles (5,034—*141,162*)—Rudge-Whitworth, Limited, and W. Blair.
Means of starting up motor engines (9,420—*141,192*)—C. Landale.
Driving mechanism for motor vehicles (12,704—*127,573*)—Auto-Motive and Accessory Export Company.
Spring attachments for tramway cars (18,720—*130,607*)—A. Deschamps.
Fluid pressure braking apparatus (873—*141,422*)—A. W. Rendell.
Springing of road and rail vehicles (1,164—*141,436*)—J. G. P. Thomas.
Regenerative control of electrically propelled vehicles (7,583—*141,488*)—A. Raworth.
Hoods for chars-a-bancs (10,828—*141,516*)—W. Nunn.
Lubrication of motor vehicles (16,059—*141,245*, 16,058—*141,566*, and 16,060—*141,567*)—S. S. Guy.
Friction disc variable speed transmission gears for motor cars (20,224—*131,318*)—P. Hanzer.
Device for driving or propelling motor vehicles (23,145—*132,812*)—V. Zboril.
Fluid pressure braking apparatus (1,169—*141,785*)—J. W. Cloud.
Means for indicating route and speed of motor vehicles (1,332—*141,788*)—F. H. Cave, G. G. C. Piggott, C. J. Stewart, and S. L. Symondson.
Automatie brakes for trailer vehicles (1,695—*141,817*)—V. Barningham and S. G. Ashby.
Self-propelled vehicles (7,328—*141,874*)—E. C. R. Marks (*Cowan Truck Company*).
Brake actuating mechanisms of tramway cars (8,122—*141,885*)—W. Heap.
Gear changing mechanism for mechanically propelled vehicles (12,491—*141,931*)—G. R. Lanchester and Lanchester Motor Company.
Electro-magnetic apparatus for use in steering moving vehicles (1,423—*142,164*)—J. G. Gray.
Automobile vehicles (1,855—*142,171*)—H. R. Godfrey and "G.N.," Limited.
Attachment to the trolley of overhead electric trams for facilitating the replacement of the trolley on the wire (3,761—*142,215*)—T. Forsyth.
Road wheels for motor vehicles (4,197—*142,223*)—R. E. and H. S Morgan.
Regenerative braking system for electrically driven vehicles (10,096—*125,988*)—K. H. O. Lubeck.
Steering axles (13,840—*142,331*)—G. M. L. Griffith and Andre, Griffith and Charnock.
Tramway trucks (15,796—*142,347*)—J. G. Brill Company and W. S. Adams.
Safety guard and life protecting device for the front wheels of motor omnibuses (17,040—*142,362*)—L. Randerson.
Automatic life-guard for motor omnibuses (20,432—*142,378*)—W. Knott.

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TRAFFIC RETURNS.

Tramway and Omnibus Undertakings in the United Kingdom.

NAME OF COMPANY OR CORPORATION.	1919. WEEKS ENDED					1920. WEEKS ENDED.					AGGREGATE.		
	May 3	May 10	May 17	May 24		May 1	May 8	May 15	May 22		Wks.	1920.	Increase or Decrease.
	£	£	£	£	£	£	£	£	£	£		£	£
Aberdare U.D. Council	613	400	Strike	567	...	608	503	666	650	...	7	3,735	+ 841
Aberdeen Corporation	2,769	3,094	3,166	3,088	...	3,207	3,197	3,259	3,291	...	50½	163,136	+ 28,498
Ayr Corporation	499	561	606	777	...	697	642	581	591	...	1	591	— 186
Barrow Corporation	699	729	787	785	...	789	747	796	798	...	7	5,478	+ 16
Belfast City Tramways	9,462	9,740	10,158	10,613	...	11,169	11,378	11,520	11,805	...	8	91,045	+ 11,291
Birkenhead Corporation	2,366	2,427	2,480	2,949	...	3,262	3,285	3,306	3,412	...	7½	24,582	+ 5,100
Birmingham Corporation	24,809	26,214	26,324	28,274	...	28,083	28,004	28,450	28,049	...	8	206,744	+ 2,674
Birmingham Motor 'Buses	1,449	1,693	1,797	2,040	...	1,927	1,913	2,139	2,042	...	8	14,493	+ 1,255
Blackburn Corporation	1,977	2,157	2,350	2,425	...	2,280	2,242	2,313	2,439	...	7½	18,810	+ 317
Bradford Corporation	10,453	10,807	11,457	12,083	...	11,800	11,874	13,000	12,291	...	6	92,450	+ 4,699
Burnley Corporation	2,955	2,994	3,131	3,147	...	3,309	3,413	3,531	3,451	...	—	—	—
Burton-on-Trent Corporation	465	464	478	487	...	549	553	530	569	...	8	4,262	+ 731
Bury Corporation	2,219	2,306	2,423	2,407	...	2,422	2,479	2,583	2,673	...	7½	19,377	+ 197
Chatham and District	1,348	1,567	1,687	1,657	...	1,670	1,697	1,734	1,707	...	20	30,597	+ 3,604
Cork Electric	517	683	663	705	...	830	811	899	884	...	20	15,899	+ 4,335
Derby Corporation	1,531	1,572	2,142	2,158	...	2,102	2,080	2,168	2,214	...	8	16,245	+ 2,524
Dundee City	2,152	2,211	2,261	...	...	2,547	2,622	2,677	...	...	52½	132,779	+ 28,734
East Ham Corporation	1,658	1,950	1,942	2,028	...	1,785	1,689	1,761	1,811	...	7⅞	13,156	— 902
Edinburgh Corporation	10,309	11,270	12,158	13,422	...	11,538	12,041	12,427	13,011	...	1	13,011	+ 413
Glasgow Corporation	31,608	32,196	33,523	34,396	...	34,531	34,239	34,421	34,014	...	51½	1,671,839	+ 191,334
Glossop (Urban Elec. Supply Co.)	218	227	225	225	...	228	252	238	231	...	21	4,854	+ 232
Huddersfield Corporation	4,339	4,711	4,865	4,829	...	4,622	4,631	4,904	4,781	...	8	31,157	— 6,923
Ilford U.D. Council	1,080	1,243	1,343	1,324	...	1,204	1,214	1,270	1,256	...	7⅞	9,218	— 268
Ipswich Corporation	719	846	914	858	...	888	874	924	969	...	7	6,957	+ 827
Isle of Thanet	646	769	856	856	...	850	843	883	942	...	33½	21,030	+ 7,070
Kilmarnock Corporation	288	316	221	309	...	327	367	433	345	...	1	345	— 113
Lanarkshire	1,093	1,881	3,692	4,045	...	4,089	4,215	4,256	4,470	...	20	81,262	+ 17,546
Leeds City	...	...	...	...	...	...	...	...	...	...	—	—	—
Leicester Corporation	5,393	5,871	6,006	6,085	...	6,624	6,772	6,971	6,982	...	8	—	—
Leyton U.D. Council	2,579	2,993	3,269	3,259	...	2,981	2,172	2,793	3,119	...	8	23,562	— 581
Liverpool Corporation	21,664	22,560	23,295	23,364	...	27,690	27,312	28,245	27,468	...	20½	536,065	+ 105,019
London County Council	72,169	81,295	82,683	84,053	...	84,282	83,914	85,172	85,340	...	7	579,763	+ 26,863
Maidstone Corporation	337	352	379	365	...	406	462	458	450	...	7½	3,332	+ 459
Manchester Corporation	29,026	30,465	31,083	31,737	...	30,386	30,780	32,069	31,460	...	8	186,654	— 40,897
Newcastle-on-Tyne Corporation	8,740	9,027	9,314	9,237	...	9,573	10,720	10,748	10,738	...	7	75,936	+ 8,354
Nottingham Corporation	6,668	7,185	7,366	7,274	...	7,397	7,603	7,654	7,664	...	7	54,258	+ 1,015
Oldham Corporation	3,823	4,055	4,205	4,625	...	4,528	4,643	4,805	5,142	...	9	35,894	— 1,566
Reading Corporation	1,363	1,559	1,579	1,602	...	1,855	1,735	1,825	1,772	...	7	13,046	+ 2,027
Rotherham Corporation	2,362	2,253	2,261	2,319	...	2,642	2,724	2,694	3,051	...	7	18,680	+ 2,311
St. Helens Corporation	...	...	...	...	...	1,807	1,862	1,890	1,932	...	7	13,038	—
Sheffield Corporation	16,614	16,447	16,826	17,272	...	20,261	20,431	20,805	21,163	...	8⅜	172,261	- 29,413
Southampton Corporation	2,436	2,674	2,731	2,754	...	2,978	2,991	3,164	3,136	...	7	19,923	+ 275
Southampton Motor 'Buses	...	...	...	...	...	206	195	215	213	...	7	1,633	—
Southend Corporation	1,424	1,596	1,774	1,824	...	1,741	1,784	1,859	1,911	...	7	13,359	+ 905
South Shields Corporation	1,293	1,334	1,422	1,346	...	1,873	1,837	1,896	1,911	...	8	13,401	+ 3,111
Sunderland Corporation	2,682	2,708	2,851	2,888	...	2,954	2,926	3,008	3,094	...	8	22,349	- 66
Swindon Corporation	296	302	335	327	...	351	362	386	369	...	7	2,670	— 312
Tyneside Tramways and Tramroads	870	989	1,100	1,047	...	1,061	1,055	1,098	1,106	...	20	21,540	+ 3,007
Wallasey Corporation	2,232	2,456	2,509	2,583	...	2,424	2,421	2,566	2,439	...	6½	18,360	— 727
Walsall Corporation	1,391	1,384	1,389	1,416	...	1,684	1,743	1,742	1,724	...	8	12,962	+ 1,863
Walthamstow U.D. Council	1,479	1,826	1,983	1,959	...	1,969	1,925	2,217	2,144	...	7⅞	15,186	- 1,911
Warrington Corporation	865	891	875	885	...	984	1,002	979	984	...	7	6,865	+ 410
West Ham Corporation	4,906	5,535	5,768	5,676	...	5,390	5,657	5,555	5,417	...	7½	38,838	— 1,850
Wolverhampton Corporation	1,770	1,903	1,962	1,965	...	2,323	2,328	2,337	2,293	...	7	16,569	+ 2,829

Colonial and Foreign Tramway Traffic Returns.

NAME OF COMPANY.	1919. WEEKS ENDED.					1920. WEEKS ENDED					AGGREGATE.		
	May 3	May 10	May 17	May 24		May 1	May 8	May 15	May 22		Wks.	1920.	Increase or Decrease.
	£	£	£	£	£	£	£	£	£	£		£	£
Anglo-Argentine	65,483	56,085	64,295	60,808	...	77,987	81,150	80,150	79,317	...	20	1,494,328	+ 329,073
Calcutta Rs.	82,424	82,629	85,878	84,397	...	93,740	94,795	91,758	92,513	...	20½	1,860,273	+ 138,835
Madras Rs.	...	...	...	...	...	...	...	...	...	...	—	—	—
Pernambuco	5,566	5,806	5,688	5,725	...	6,875	7,081	6,256	7,001	...	20½	157,084	+ 44,496

Companies issuing Monthly Statements only.

	1918.	1919.					1919.	1920.					Wks.	AGGREGATE.	
	Dec.	Jan.	Feb.	Mar.	April	May	Dec.	Jan	Feb.	Mar.	April	May		1919-20.	+ or —.
	£	£	£	£	£	£	£	£	£	£	£	£		£	£
Ballarat & Bendigo	4,504	3,603	3,052	3,623	...	...	5,119	4,250	4,279	4,182	...	...	52	49,855	+ 4,097
Brazilian Trac. Mlrs	8531000	8522000	7972000	9330.000	9208000	...	9739000	9655000	9381000	9.900000	10245000	...	17	39181000	+ 4,149,000
Brisbane	...	38,575	34,380	39,380	38,775	...	...	44,800	41,600	45,460	44,690	...	17	176,750	+ 25,640
British Columbia $	691,065	677,489	645,415	649,120	...	...	783,324	828,709	746,030	761,182	...	...	39	6,557,837	+ 1,167,718
Buenos Ayres L'c'z.	50,460	41,556	42,429	47,370	...	...	55,873	52,642	52,468	55,000	...	...	39	453,687	+ 63,108
Burma	34,593	38,265	35,926	38,440	36,814	...	43,571	41,749	41,814	45,117	44,673	...	39	402,412	+ 76,427
Cape Town	...	...	...	...	22,564	...	...	26,009	20,623	25,089	25,010	...	—	—	—
Carthagena & H.	2,950	3,655	2,351	2,400	1,786	3,226	2,923	4,748	4,008	3,493	5,482	5,313	22	490,576	+ 178,444
East India	2,048	1,970	1,689	2,016	1,920	2,131	2,916	2,988	3,001	3,592	3,916	3,980	43	31,549	+ 11,870
Kalgoorlie	2,848	2,562	2,278	...	...	...	2,560	2,573	2,677	...	...	...	8	5,250	+ 410
La Plata	5,792	5,730	6,698	6,592	5,631	...	6,324	3,155	6,894	6,392	6,142	...	17	22,583	— 2,066
Lima	...	...	46,110	...	...	...	...	...	56,050	...	...	...	8	114,635	+ 23,195
Manila $	236,612	231,586	211,676	207,876	...	...	276,000	278,338	278,243	263,690	...	...	13	820,578	+ 169,440
Monte Video	...	40,910	...	...	...	...	...	47,767	...	...	...	...	13	132,450	+ 21,401
Para	23,800	24,515	23,248	26,022	25,342	...	24,412	24,306	24,303	24.883	24,771	...	21	122.675	— 252
Peruvian $	1057990	...	...	1199420	...	...	1310880	...	...	1302820	...	...	—	11987814	+ 1,738,859
Port Elizabeth	...	...	...	5.576	...	...	...	7,827	6,166	7.214	6.381	...	—	—	—
Rangoon	6,188	6,373	5,694	7,533	6,217	...	5,717	7,467	7,667	8,698	7,857	...	17	31.689	+ 5,427
Toronto $	...	1106840	1015797	1083285	...	...	...	1130486	1113717	1255668	...	...	13	3.499.871	+ 293.949
Winnipeg $	...	390,539	371,162	384.937	...	...	...	498,837	444,873	456,915	...	...	13	1.400,625	+ 253,987

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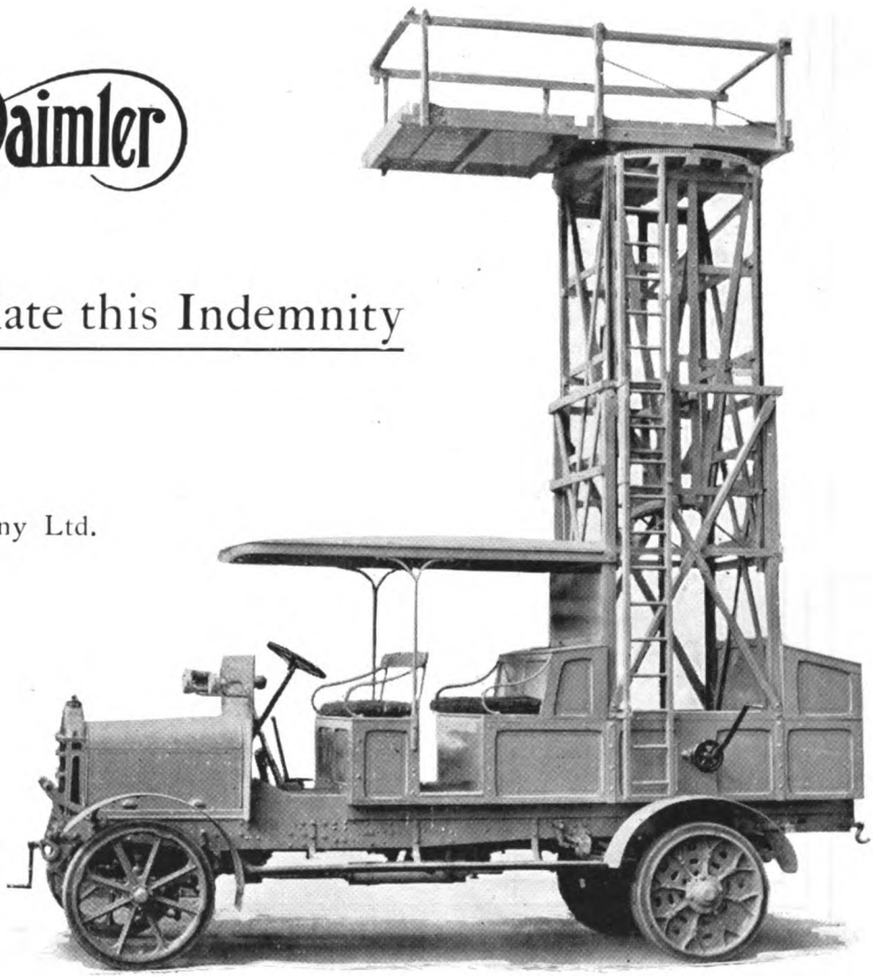

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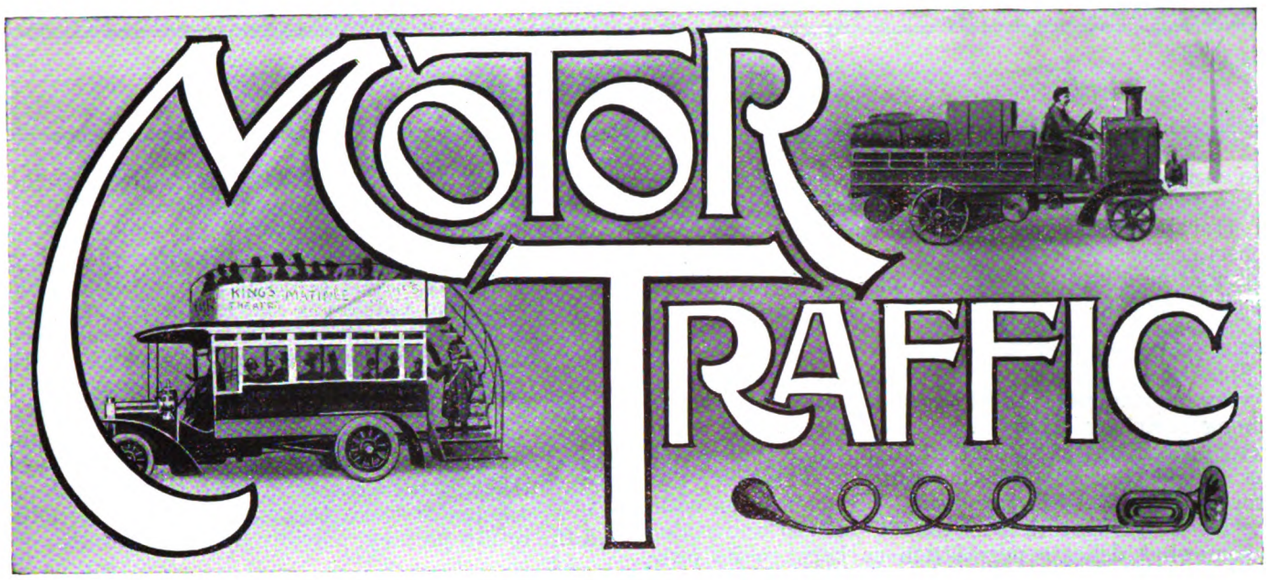

UNLADEN WEIGHT.

There has lately been some discussion as to the proper definition of the term "unladen weight" as applied to a motor vehicle. The matter now has added importance owing to the fact that the taxation of goods-carrying vehicles is to be based upon unladen weight. It is therefore necessary that a definition should be agreed for good and all, and should not be subject to variation at short notice. In the past it has been customary to regard fuel and water as part of the load placed upon the vehicle and not as part of its weight. This seems perfectly logical, despite the argument on the other side that it is no good to weigh a vehicle other than in the condition which makes it capable of travelling along the road. Were one to carry this latter point of view to its natural conclusion, one would have to include the weight of the driver as part of the weight of the vehicle, which, from a practical standpoint, would obviously be out of the question. The new scale of taxation now proposed is unquestionably based on the assumption that the existing definition of unladen weight will be retained. To include the weight of fuel and water would be to introduce an extremely awkward complication. Either an arbitrary allowance would have to be made in respect of both or else all tanks and bunkers would have to be completely filled, and this would unduly penalise vehicles provided with accommodation adequate for a long journey without renewal of supplies on the way. What really matters to the roads is the laden and not the unladen weight, so that so long as we lay down a maximum laden weight and a maximum axle weight the definition of unladen weight does not matter much from this standpoint. Some vehicles carry permanent equipment which has no connection with their power of movement, but is used either to facilitate loading and unloading or to enable specific work to be done while the vehicle is stationary. Thus, for instance, a jib crane may be carried to help loading. If this were detachable it could evidently be carted about as part of the load. If it is a permanent fitting its use remains the same, and therefore it should come into the same category. It should be regarded as load and not as part of the weight of the vehicle. Again, a vehicle may carry electric machinery of considerable weight, capable of being driven by the engine provided that the vehicle is stationary. This machinery should be regarded as part of the load carried. Its presence has, of course, the effect of reducing the amount of ordinary useful load that can legally be transported at the same time. Altogether the case in favour of the definition which excludes everything not forming an essential part of a vehicle constructed to carry goods under its own power seems to be abundantly strong. We do not altogether like the suggestion that the Minister of Transport should have power from time to time to schedule fittings which are not to be included as part of the unladen weight. In effect this would give him the power of altering the taxation liability of a large number of vehicles at short notice.

SPEED LIMITS.

The whole question of speed limits must be reviewed at a very early date, and there is reason to believe that the Ministry of Transport will be prepared to take a broadminded view of the matter. The 20 mile speed limit for private motor cars is undoubtedly an anachronism. If it was reasonable at the time when it was imposed it must certainly have now become unreasonable in view of the vast improvement that has been made in the construction of vehicles, including such points as suspension, brakes, and control generally. From the standpoint of public safety the maintenance of a law imposing arbitrary speed limits would be absurd, since we know that this law has been universally disregarded for many years past. Nowadays it serves only as a means of replenishing the local exchequers of a few reactionary districts who presumably cannot find a better use for their police force. The law of the future must merely provide heavy penalties on proof of dangerous driving being produced. We cannot, of course, entirely abolish speed limits in respect of the heavier classes of vehicle, since by doing so we should subject the roads to unduly rough usage. Here again, however, vehicle design has vastly improved. Moreover, all motor owners are to pay big sums for the maintenance and improvement of roads. From both points of view the old speed limits are no longer justifiable, and an all-round increase should certainly be permitted. It would be better not to lay down speeds by statute, but to give the Minister of Transport power to issue regulations from time to time. Perhaps the most substantial increase allowed in the first instance should be in respect of any vehicle drawing a trailer, particularly if both the vehicle and the trailer are rubber-tired. The encouragement of the use of trailers is tantamount to facilitating the more efficient use of vehicles by increasing the loads dealt with. By these means and by the raising of speed limits we can effect immense improvements in

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MOTOR TRAFFIC

the economy of transport and in the speed with which it can be conducted. It is understood that the Ministry of Transport is now engaged in framing a new Act consolidating and simplifying motor law, and doubtless this matter of speed limits will be one of the first to receive attention.

THE PENALTY OF DISUNION.

Since the publication of the provisions of the Budget a very regrettable lack of unity has been noticeable among motoring interests. A few months ago these were solid in maintaining that, if possible, the petrol tax should be retained as being much fairer than the proposed scheme of licence duties. In connection with the latter the motoring movement had to undertake a somewhat delicate negotiation as between its own component parts. The question of the proper allocation of the burden of taxation between various types of vehicle had to be settled. A settlement was, in fact, reached in a conference held at the Royal Automobile Club, where a resolution was passed advocating the retention of the petrol duty, but, failing that, agreeing as to the apportionment of licence duties among private cars, commercial and public service vehicles. No sooner were the Budget proposals made public than some people, we believe without any good cause whatever, leapt to the conclusion that efforts would be made to upset the agreed proportions. The result is that certain groups of motor owners have now made public statements supporting the principle of the licence duty as against that of the petrol tax, this being entirely contrary to their own previous decisions. It is most improbable that, even if unity had been perfect, it would have proved possible to induce the Government to go back on its main decision. The point is, however, that united action, if unsuccessful in the main object, would undoubtedly have been successful in various minor objects. As things are, the lack of cohesion will undoubtedly result in very little weight being attached in official quarters to the views of the motoring community. The arguments put forward by some bodies are contradicted by others, with the natural consequence that all are equally disregarded, and we lack the solidarity which would have enabled us to secure the redress of certain minor grievances. For years past thinking people have urged the motoring community to organise unity within itself, and there can be no doubt that by so doing it would attain considerable political influence. Now the prospect of building up such influence has receded further than ever into the background. The position is not creditable to the industry, and we appeal to the leaders to consider what steps can be taken to obtain greater unity of action.

MOTOR COACH DEVELOPMENT.

Many of this year's motor coach developments are distinctly interesting as revealing the tendency that we have long anticipated towards the organisation of motor coach tours of considerable length. Before the war such tours were arranged by a very limited number of enterprising local proprietors. Messrs. Chapman, of Eastbourne, and the Bristol Tramways and Carriage Company were, we believe, amongst the pioneers in this direction, arranging tours as far afield as Cornwall and South Wales, and charging inclusive fares for the seat on the vehicle and for board and accommodation for about six days. Now motor coaches run regularly, and in some cases daily, between London and a number of seaside resorts. In some cases the idea goes further, and the run lasts for several days or a week. An interesting development is to be found in the tours from London to the Isle of Wight, where a circular trip is taken. The particular point here, of course, lies in the necessity for making a short sea trip across to the Island, and therefore for linking up the service at two points. One may expect very soon to see this same scheme worked on a larger scale, and Londoners being offered for inclusive fares motor coach tours to the coast, the cross Channel trip, a continuation of the motor coach tour in the North of France, and the return journey, possibly by another route.

RATES OF EXCHANGE.

A long time ago the Government promised to promote legislation for the prevention of dumping. An attempt was in fact made to fulfil this promise, but failed owing to the opposition of various interests in the House of Commons. Closely allied to dumping is the importation of goods from countries where the value of the currency has so far depreciated that, when manufactures come to be sold for British money, prices are abnormally low and are such that British manufacturers cannot possibly compete on equality. It was intended to deal with this contingency and with dumping at the same time. Now that the Government's policy in these respects has been blocked by opposition a very serious position has arisen in front of the British motor industry. France prohibits the import of motor cars. Italy will only allow 10 per cent. of her output to be sold in the country of origin. Commercial vehicles can come in from the United States free of duty. As anyone could have foreseen, tens of thousands of surplus motor vehicles are coming upon the market. Everyone who has stuff for disposal looks to the free market of the British Isles to absorb it. Thus the prospect is that by the time the output of the home industry has really reached its full extent the markets will be found to have been filled and a period of very serious depression in the industry must almost certainly be the result. We are told that we must take a complacent view of all these contingencies and developments. It is natural, for instance, that Italy should wish to stabilise the rate of exchange upon a more normal basis. If that can be done she will be in a better position to buy various supplies which she requires from Great Britain. The trouble is that meanwhile the prosperity of certain of our own industries, among which the motor industry figures prominently, is being more than jeopardised.

NEW ALBION FACTORY.—Willesden Council have been asked by the Albion Motor Car Company, Limited, in view of the fact that they are building a factory in Brentfield Road, whether the Council would be willing to widen the bridge over the canal feeder in order that lorries could pass abreast. The Council have replied that if such bridge is widened the cost must be borne by owners of property abutting upon the roadway.

FAILURE OF AN ACTION AGAINST THE L.G.O.C.—In the King's Bench Division, Mr. Justice Shearman gave judgment for the defendants in an action for negligence brought by a lady who sustained injuries due to a crowd overpowering the conductor of an omnibus of the London General Omnibus Company before she could alight. The evidence showed that the people were temporarily out of control, although officials were present to regulate them, and the judge held that there had been no negligence.

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MOTOR TRAFFIC

PUNITIVE TAXATION.

To the Editor of THE TRAMWAY AND RAILWAY WORLD.

Sir,—I trust you will allow me to call public attention to the very serious consequences which will follow if the new system of taxing motors at fixed rates be established instead of taxing them by their actual usage of the road. As the subjoined figures show, the new taxation is all in favour of a few groups of big-mileage motor interests, whilst a crushing burden is passed on to the small-mileage vehicles.

As a pioneer of commercial motor traction I can say that this unjust method of taxation will have a very grave effect on the many small motor transport concerns all over the country. Here are the figures, prepared by an expert on motor taxation, comparing the present taxation by mileage, as levied automatically by the petrol tax. Alongside is placed the fixed rate of vehicle tax which is to be imposed irrespective of mileage—

	Present Tax.	New Tax.	Increase per cent.
London omnibus (36,000 miles) ...	£75	£84	12
Country omnibus (18,000 miles) ...	£38	£70	84
12,000 mile commercial motor ...	£25	£25	–
6,000 mile commercial motor	£12½	£25	100
20 H.P. private motor	£13	£20	53

It is obvious from these figures that the small-mileage country omnibuses and commercial motors and the majority of the private motorists are being exploited in the interest of the big-mileage motors. The injustice of this is evident when we consider that wear and tear of the roads is in proportion to the mileage and to the weight of the vehicles.

Logically, the tax on each motor should be in direct relation to its actual mileage and weight; and if we take a ton-mileage basis for comparison of taxation methods, we get the following instructive figures, which completely disprove the fallacious statistics issued by the Ministry of Transport and its apologists—

	Present Tax per Ton-mile.	New Tax per Ton-mile.	Increase per cent.
London motor-omnibus ...	·16d.	·18d.	·12
20 H.P. private motor ...	·50d.	·80d.	60

Here we see that at present *the private motor pays three times as much in tax per ton-mile as the big-mileage omnibus.* By the new taxation scheme the private car will pay more than four times as much per ton-mile as the big-mileage omnibus, and this tax must be paid by the private car whether it runs 1,000 miles or 6,000 miles per annum.

It is thus clear that the majority of commercial and private owners whose vehicles do low or moderate mileages are to be penalised in favour of a minority of big-mileage interests, although the greater proportion of road wear, and damage to bridges, etc., is done by the latter class. Is it surprising that this section of the motor movement has been the only one to actively support the Ministry of Transport in its effort to abolish the petrol tax?

Although the big mileage interests have gained a selfish advantage by throwing over their brother motorists, and siding with the bureaucrats, I warn them that they are playing a dangerous and foolish game. We are approaching a most critical period in road transport, and I appeal to all motor owners to join together and make common cause. By a flat rate of 4½d. per gallon on all imported petrol, and by an adjustment of the license duties, every motor can pay its fair share of tax in proportion to its use of the road. The figures of petrol consumption to-day prove beyond all doubt that the money can be obtained from a flat rate tax; and if we unite to defeat the bureaucrats in their sinister effort to abolish this tax we shall prove our strength for the bigger attacks which will be made against us in future.

Yours truly,

June 4, 1920. H. G. BURFORD, M.I.Mech.E., M.I.A.E.

MANCHESTER'S TRUNK ROADS.—Manchester Corporation propose to borrow £80,000 for the reconstruction of the main trunk roads carrying heavy traffic in such a substantial manner that the thoroughfares will have a life of at least 30 years.

THE PETROL DUTY.

STATISTICS OF A YEAR'S CONSUMPTION.

In the House of Commons, on May 5, Sir W. Joynson-Hicks asked the Chancellor of the Exchequer the quantity of petrol on which duty had been paid during the year ended March 31, 1920, tabulating for each month of that period the quantity on which full duty has been paid and the quantity on which the usual rebate has been allowed?

Mr. Chamberlain.—The information is as follows—

	Net Quantity, duty paid (after deducting rebates)		Quantity on which rebate of full duty has been allowed	
	Full Rate	Half Rate	On repayment of duty	Delivered free
1919	Gallons	Gallons	Gallons	Gallons
April*	5,659,000	3,328,000	261,000	386,000
May	6,712,000	3,848,000	285,000	448,000
June	6,600,000	3,595,000	303,000	544,000
July	8,350,000	4,433,000	326,000	654,000
August	9,274,000	4,091,000	418,000	521,000
September	9,388,000	4,480,000	320,000	453,000
October	10,783,000	4,194,000	186,000	484,000
November	7,426,000	5,215,000	242,000	442,000
December	6,496,000	5,655,000	279,000	760,000
1920				
January	7,545,000	6,070,000	436,000	650,000
February	6,636,000	5,427,000	612,000	601,000
March	6,639,000	6,857,000	395,000	692,000
Total ...	91,508,000	57,193,000	4,063,000	6,635,000

* The figures for April include home-made petrol, the duty on which was repealed May 1, 1919.

GIANT PNEUMATIC TIRES.

LONDON GENERAL OMNIBUS COMPANY'S EXPERIMENTS.

From time to time announcements have been made in these columns that American operators of heavy motor vehicles are not alone in the experiment of using giant pneumatic tires.

Particulars of the difficulties met with have also been published, together with the statement that the results attained in the United States have been confirmed by the London General Omnibus Company's experience. In the latter case these tires are fitted to a few heavy lorries operating between the various garages. On the whole the results in London have not been unsatisfactory, and the sequel will be to greatly facilitate the adoption of pneumatic tires on omnibuses. Save in the way of experiment that day is as yet distant, but the company look forward to using such vehicles not only in the Metropolitan area and on the rural routes now traversed, but for service to the coast resorts. Lord Ashfield has lately announced that this is to be the company's aim, and that the use of pneumatic tires will enable a speed of 18 miles an hour to be attained. That will be two miles below the speed limit, and for such ponderous vehicles as these double deck omnibuses it will be as high as can with safety be achieved, although only six miles in excess of the speed at present permitted.

Notwithstanding the increasing competition from coaches running at higher fares, the demand for omnibus outings at week-ends has shown a great advance since the war. This is likely to be accelerated when it is possible to place the new type (solid tires) of vehicle on the country routes. At present the A.E.C. works at Walthamstow are producing them at the rate of 50 per week, and although the company have nearly reached their pre-war service of about 3,000 omnibuses in daily service, there are times when many more could be utilised. At holiday periods the company are now faced by the difficulty of the greater number of passengers to country termini wanting to make the return journey by the last omnibus. At Whitsuntide this trouble was so pronounced that volunteers had to be called for among the employees to take out vehicles and bring back passengers who had been left behind. One-way traffic of that sort cannot be altogether profitable, and the public will have to be educated to a sense of their duty.

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PLYMOUTH'S OMNIBUS SELECTION.

THE STRAKER-SQUIRE SINGLE-DECK 1920 "A" TYPE CHASSIS.

The drawings of the 34-seat body of the Straker-Squire omnibus, and a photograph of the complete vehicle here reproduced, are of special interest in view of the adoption of this make and type of omnibus by Plymouth Corporation after severe tests on Devonshire hills and roads. An order for 20 of these vehicles has been placed with the local agents of Straker-Squire, Limited, by Plymouth Corporation, and the omnibuses will be put in service as soon as they can be delivered.

Improvements suggested by the intense and prolonged running on war service abroad and in this country have been embodied in the Straker-Squire 1920 "A" type chassis. It is to the advantage of users that the company have taken time to present the improvements in a finished and tested form, after their new works, established in the factory at Edmonton, purchased from the Government, have been thoroughly prepared for quantity production. Appended are the details of the body specification—

Seating Accommodation.—Six rows of seats facing forward are arranged on either side of the centre gangway, each seating two persons. Provision is made for three other passengers on the driver's seat and three at the rear end of the body.

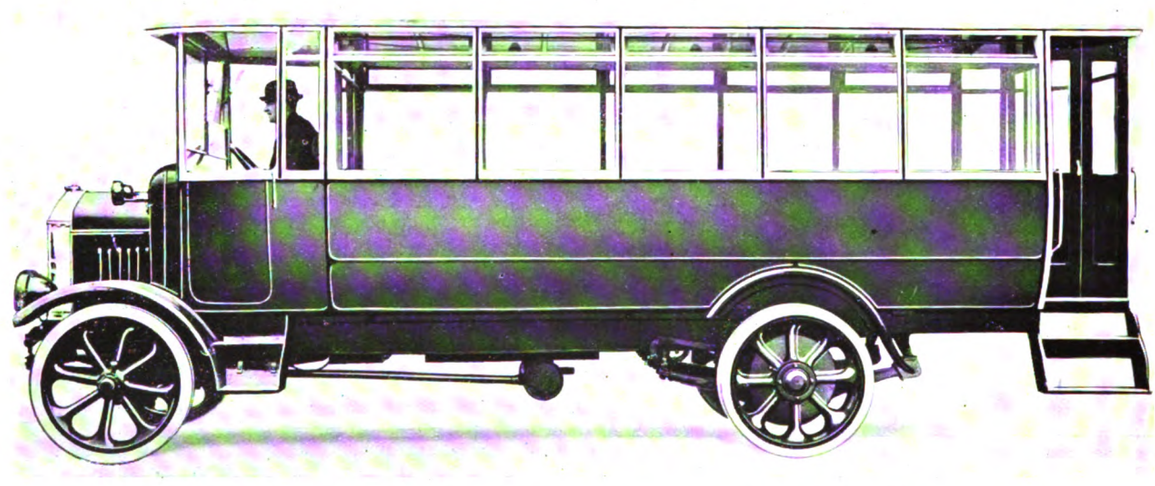
Lighting.—All bodies are suitably wired to take six interior lights. Dynamo, accumulators, switchboard, head, side, tail, and interior lamps, together with necessary wiring, can be supplied as an extra. Accessories and fittings are supplied as follow—One pair of side lamps with brackets (oil), 1 only tail lamp with bracket, 2 number plates, 1 horn, 1 signal bell.

Extras.—Route indication boards, writing or lettering, gangway seats (which can be fitted to increase seating capacity to 41 passengers), suitable roof and luggage rail for carrying luggage, leather upholstery, safety guards to rear wheels.

THE PLYMOUTH MANAGER'S TESTS.

With the twenty omnibuses it is intended to augment the tramway service and to open new routes that are unsuitable for tramways. Omnibuses will also be used for linking up the surrounding villages and acting as feeders to the cars. Mr. H. P. Stokes, the engineer and general manager, states that the single deck, saloon type was considered most suitable for meeting the local conditions. Moreover, as several routes have low railway bridges, there was insufficient clearance for double-deck vehicles. It was also decided that quicker loading could be effected with the single-deck body.

Mr. Stokes's choice fell upon the Straker-Squire type after a very thorough investigation. He visited several towns where omnibuses are in operation, observed their work under ordinary conditions, and then tested their running under prevailing local conditions. The area in which the omnibuses will be used is exceptionally hilly,



The Quick-Turning 34-Seat Straker-Squire Omnibus. The Chassis is the 1920 "A" Type.

Body Construction.—All framework is in best quality hard wood, joints well put together, secured and strengthened with body plates. The entrance is at the near side rear end, two steps and hinged panelled doors being provided. Plate-glass is fitted to all main windows, the ventilators having ordinary sheet-glass. Access to the driver's seat is gained by a high side door on the near side. The body panels are in mahogany, the rear off side corner, front door, and dash panels being beaten in steel. Trap doors are fitted to give access to the gear box and back axle, and the interior gangways are fitted with slats; two truss rods acting also as hand rails are fitted to the interior.

Ventilation.—Two windows on each side of the body are hinged in the centre, the top portion of the frame folding inside the lower portion when the windows are open, ample roof ventilation being obtained by the addition of hinged ventilators of the ordinary type.

Painting.—Unless ordered otherwise, the interior and exterior of the roof will be in white enamel.

Upholstery.—The interior cushions are well sprung, the seat backs being deep and well padded; the covering material throughout will be in Rexine, with colour to customers' choice.

Finish.—A plate-glass screen is fitted to the edge of the scuttle dash, sufficiently wide to give good protection to the front seat passengers, part of which is made to open outwards. Substantial commode handles are fitted at the rear entrance and one at the entrance to the driver's seat. The front and rear steps are covered with rubber matting with suitable metal edging. All metal work to be brass finish. Every care is taken to prevent body rattles.

and the streets of the town are very narrow. The Straker-Squire chassis has a quick turning movement, and for tackling the steep gradients in the district the high horse-power of this type was essential. On tests at Plymouth the omnibus, which has a normal seating capacity for 34, was packed with 46 people, and negotiated the grade of 1 in 6·45 with the engine acting as brake in the second gear and the foot brake very lightly in use. The omnibus was again put on the gradient, stopped in the middle, and got away easily, and was in the second gear before reaching the top of the gradient. Mr. Stokes states that he has no doubt of the extreme utility of this type of vehicle, and that the fleet will probably be augmented soon after the first consignment has been put in operation.

EXAMINATION OF TRACTION VEHICLES.—In reply to Viscount Curzon, who asked whether an examination of the traction system of public service and other heavy industrial motor vehicles was insisted upon by the Ministry of Transport, Mr. Neal replied:—Public service and heavy industrial motor vehicles have to comply with the provisions of the Locomotives Acts and the Motor Car Act, 1903, and of the Orders made thereunder. Public service vehicles, by which I understand my noble friend to mean hackney and stage carriages plying for hire, are also subject to inspection by the licensing authority. The enforcement of the regulations and by-laws, both as regards public service and heavy industrial motor vehicles, is a matter for the local authorities and the police. The Minister does not propose to appoint inspectors for this purpose.

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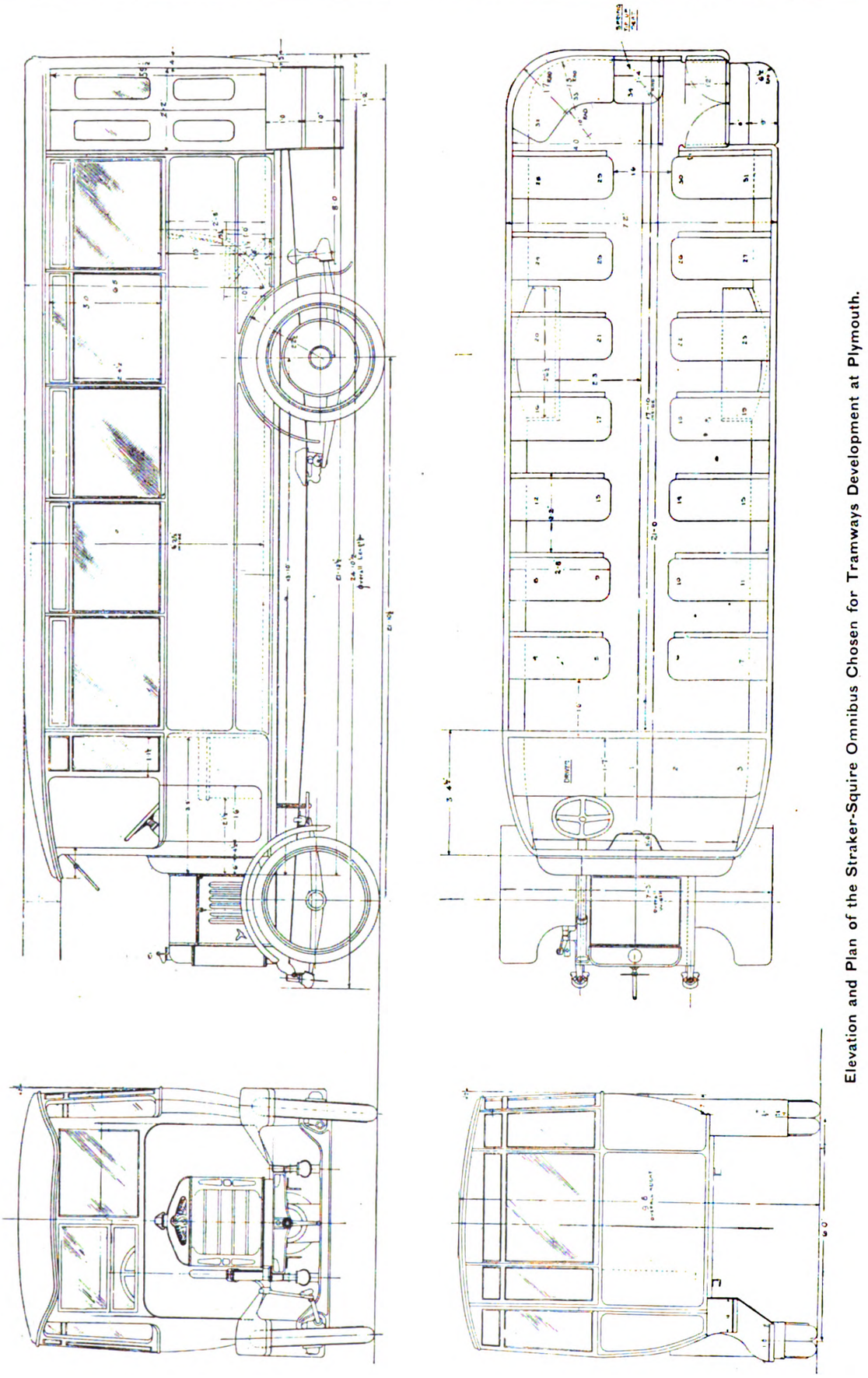

Elevation and Plan of the Straker-Squire Omnibus Chosen for Tramways Development at Plymouth.

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THORNYCROFT ACHIEVEMENTS.

If the great engineering firms of this country were to issue a publication similar to that which has recently been distributed by John I. Thornycroft and Company, a literary craftsman could construct from them a history of the war far exceeding in interest the Official Histories. As the country was often reminded in its early stages, the war was largely one between scientists. In "Half a Century of Thornycroft Progress and Five Years of War Work" some of the engineering deeds are set forth without any attempt at self-eulogy. The handsome volume is worthy of the company of which Sir John Thornycroft is the head. In 50 artistically printed and illustrated pages (the latter predominating) it deals with the 50 years' existence of the firm, which has works at eight places in this country and also at Calcutta and Shanghai. The company's products have ranged from turbine steamers and yachts to river craft, from cruisers, destroyers, and flotilla leaders to Admiralty tugs; from decoy ships to coastal motor boats (all of which assisted in the defeat of the German submarine menace to civilisation); from stern wheelers for Nigeria and motor coasters for Chile to hospital ships and launches for Mesopotamia; from Nile tourist steamboats to the repairing of torpedoed liners, etc., and from motor barges to road motor vehicles which played so important a part in the various theatres of war. In reading the chapter relating to vessels for the Royal Navy the possessors of this volume become absorbed in what have hitherto been closely guarded secrets. At the outset the company's naval works were largely engaged in their old task of increasing the number of destroyers, which were urgently needed. Next they were given the task of constructing submarines in addition, for which their knowledge of the internal combustion engine fitted them. The "Lance," one of the company's destroyers, was engaged in her speed trials at the outbreak of the war. Recalled to Harwich she was got ready for sea in time to fire the first shot of the sea war at a German mine-laying ship, which was sunk in one of the principal channels entering the Thames. The shortage of materials engendered by the Army's munition demands led to the substitution of different materials for naval fittings, but not to the detriment of efficiency. From August, 1914, to November, 1919, the company delivered 29 destroyers and repaired 525 damaged or torpedoed vessels. Thornycroft's were responsible for the design of a new and vastly more powerful class of flotilla leader. When the submarine campaign was at its height and even the "Q" ships were rapidly falling victims, the company turned to account their experience of constructing the tunelled-stern type of river steamers, of such shallow draught as to be practically immune from torpedo attack, for a torpedo cannot be set to run with certainty at less than about 6 ft. below the surface. This vessel, heavily armed with disappearing guns, had many torpedoes pass under her. Not the least interesting references are those relating to the coastal motor boats, for the construction of which the firm were especially fitted by their pre-eminence in designing and building motor racing craft. These boats were sent as far away as the Baltic (where one sank a Russian warship) and the White Sea. Letters published from the Admiralty show a generous appreciation of the company's services to the Government. Motor vehicles and munitions constitute an interesting chapter. Thornycrofts took up the construction of commercial vehicles in 1896, and were one of the first to submit them for trial under the War Office subsidy scheme. A fleet of 100 was under construction when war was declared, and they put in hand a batch of 500 vehicles as a stock order. Shortly afterwards they were instructed to undertake the largest possible output. The motor works at Basingstoke was one of the first in the country to employ women on motor vehicle construction, and at the end of the war the women there totalled more than 35 per cent. of the workers. The Ministry of Munitions sent thither representatives from other parts of the country to study the firm's methods. Basingstoke also had a large output of motors for boats, and for driving dynamos and other purposes. On August 4, 1914, those works were able to send by motor lorry, generating sets capable of working the searchlights which were badly wanted at various places on the coast. A Thornycroft lorry conveyed from the Cape-Cairo Railway to Lake Tanganyika the two Thornycroft launches and guns which were sent as a surprise expedition to deal with the Germans gunboats on the lake. This expedition was one of the finest achievements of its kind ever carried out. In turning over to peace work there was but little disorganisation. For instance, men who built the coastal motor boats are now at work on motor lifeboats for new passenger vessels and numerous orders for trading and general service launches in all parts of the world. Before the war the company had a large colonial and foreign motor vehicle trade, and this is being facilitated now by the works which have been opened in Calcutta and by branches and agencies in various Colonies. These offshoots are available for erecting complete vehicles from the parts shipped abroad in the smallest possible compass. In their Indian business, the company have been aided by the fact that during the war they were called upon to manufacture a special design of vehicle for the mountainous frontier countries to meet the requirements laid down in a report prepared for the Indian Government by Lord Montagu. At home a new depot has been opened in London, and first-class repair depots at Manchester, Leeds, and Glasgow, while agencies are to be found throughout the country.

In this review we have given only a bare outline of the company's operations. It only remains to be said that directly war was declared they contributed many of their staff and employees to the Royal Navy, the specialist corps of the Army, and the Territorial Force. As many as 20 per cent. of the men at the Basingstoke Works were claimed by the latter force.

THE VULCAN MOTOR COMPANY'S ENTERPRISE.

ONE HUNDRED CHASSIS PER WEEK.

The Vulcan Motor and Engineering Company, Limited, at their works at Southport, on June 4 completed the construction of the thousandth chassis since January 1. To celebrate this achievement the directors entertained at dinner at Southport on June 4 a large company, including a number of their agents, representatives of the firms who supplied the raw material used in the construction of the machines, and others interested in mechanical traction. The chairman of the company, Mr. C. B. Wardman, presided, and in his reply to the toast of "The Vulcan Motor and Engineering Company," proposed by the Mayor of Southport (Councillor R. Wright), said that in the five months from January 1 they had produced a thousand commercial chassis, and commencing with that week the output of the works would be at the rate of one hundred chassis per week. In view of the fact that ten months ago they were still building aeroplane engines, and that the change-over and reorganisation of the works had to be carried out before the output of motor chassis could be planned, he thought they had every reason to feel proud of their achievement. It was obvious that such a result could only have been obtained by the hearty co-operation of all interested in the output of the works. He specially wished to thank the supply firms whose regular delivery of stampings, steel bar, etc., had contributed so largely to their success. He also wished to pay a tribute to the little country of Belgium for their assistance in the dark days of the moulders' strike. With regard to their own people, it was the untiring efforts of their general manager, Mr. Walker, ably supported by Mr. Rimmer, works manager, and the whole of the staff that had led to such splendid results. He believed that the only record passing that of the Vulcan Company was made by a firm employing five times the number of workmen and many times the capital of the Vulcan Company.

A pleasant incident at the dinner was the reading by the chairman of a letter from Major Clive Wigram written on behalf of the King, expressing His Majesty's pleasure upon hearing that so much had been done at the Vulcan Works to provide employment for ex-service men, over a thousand of whom are regularly employed.

During the afternoon the visitors were given an opportunity of inspecting the works and viewing the various operations through which the component parts of the chassis pass in the course of their manufacture. A noteworthy feature of the works organisation is the installation of a large number of multi-operation tools. By this means much time has been saved, as the setting up and making ready of the job for single operations has been reduced to a minimum.

OMNIBUSES FOR HULL.—The Hull Tramways Committee have approved the general manager's plan for the intended omnibus route to Stoneferry. The chairman and general manager have been authorised to inspect any vehicles they might consider suitable.

MOTOR REPAIRING TRADE APPRENTICES.—In the House of Commons on May 5, Mr. Hurd asked the Minister of Labour whether, in order to help ex-soldiers, he will alter the classification of motor repairing as skilled engineering and give those whose apprenticeship was interfered with by the war, either in an engineering shop or motor repairing business, the full advantage of Government assistance to apprentices? Dr. Macnamara.—A considerable number of ex-service apprentices in the motor repairing trade have already been brought under the scheme for the engineering industry. As part of their training they require instruction in operations which belong to the engineering trade. It would, I am advised, not be possible to prepare a scheme for motor mechanics only, but the matter shall be looked at again.

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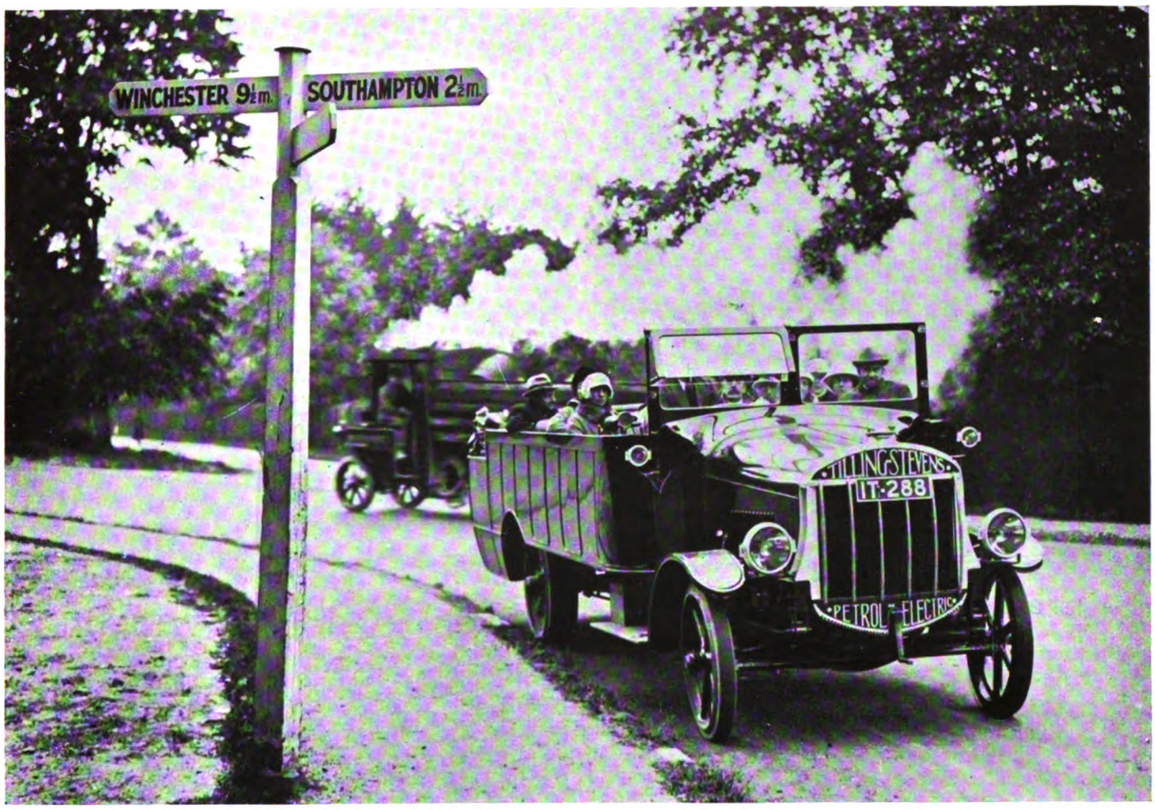
MOTOR TRAFFIC

SEEING BRITAIN BY MODERN COACHING.

An excellent series of tours by motor coach and steamer has been inaugurated by Birch Brothers, Limited, of Kentish Town, for the summer months. Special attention has been devoted to the selection of the routes, the scenery embraced being the finest in Great Britain. The tours are arranged for one or two weeks, according to the distance traversed, and are combined with steamer and hotel accommodation, the stated charge being inclusive of attendance, gratuities, etc.

The vehicles used on these tours are of the latest design and construction, and afford the utmost degree of comfort for the passenger. The chassis is the well-known Tilling-Stevens petrol-electric, which by means of the electric drive gives that smoothness of running so desirable for the complete enjoyment of long motor rides. The body work is an excellent example of the high-class coachbuilding for which Messrs. Birch Brothers are so well known, the vehicles being specially designed for comfort rather than passenger capacity. Lounge armchairs take the place of the ordinary seats, while ample room and a luggage compartment are provided, the latter filling the space below the folded hood. The hood, when extended, provides complete protection in bad weather. The motor coaches start from the company's office at 206, High Holborn. An illustrated booklet, "Seeing Britain," giving full particulars of the various tours, together with the itinerary of each, can be obtained on application to Messrs. Birch Brothers, Limited, 20, Cathcart Street, Kentish Town.



Daily Mail Photo.] **Approaching Southampton on One of Birch Brothers' Coach and Steamer Tours.**

GOVERNMENT MOTOR CARS.

TWO LONDON GARAGES.—THE SAVING OF TIME.

In the House of Commons, on May 10, Sir E. Geddes, replying to Col. Guinness, said the number of cars maintained under the charge of the Ministry of Transport was 25. Two garages were used, at rents of £325 and £100 per annum. During March 2,191 officials were carried, the mileage being 28,213, and the petrol consumption 2,255 gallons. Asked if he could not take steps to draw the attention of the Post Office, the War Office, and the Admiralty to the pool of cars and the necessity for restricting the use of their individual cars, Sir Eric said that the question was carefully considered by the Cabinet in the interests of economy, and it was decided that the Post Office and the three fighting services should maintain their own cars. He could not say if the Admiralty had ten cars.

On May 13 several questions were put to the leader of the House of Commons concerning the number of cars in use by Government officials. Mr. Bonar Law replied that no member of the Government now had the use of a publicly maintained car, and that the cars in use are now very few. In every instance a voucher had to be given when the car was used. Asked why the Admiralty should maintain their own cars outside of the official pool, Mr. Law said the number was very small, and both the Cabinet Committee and the Treasury had come to the conclusion there would be no economy in putting them into the pool. Lieut.-Commander Kenworthy.—How did they get on before the war without cars? Mr. Bonar Law.—It is natural to take that view, but the conditions have greatly changed. It is our view that there is actual saving of time to be put against the additional cost.

HIGHER INSURANCE PREMIUMS.—At Glasgow Corporation Garage Committee the manager reported that the Car and General Insurance Corporation, with whom the department was at present insured against third party and other car risks, had intimated that an increased premium would be required. The committee asked the manager to obtain quotations from various companies.

MIRRORS FOR MOTOR VEHICLES.—In reply to a suggestion by Viscount Curzon asking that in any amendments of the Acts relating to the use of motor vehicles the carrying of mirrors should be made compulsory to enable the driver to obtain a view of overtaking traffic, Sir Eric Geddes said that the suggestion would be considered by the Departmental Committee on the Taxation and Registration of Road Vehicles.

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MOTOR TRAFFIC

TRIUMPH OF THE "BLUE BIRD" 'BUS.

A happy inspiration seized the traffic development department of the London General Omnibus Company at Whitsuntide. It was seen in sending out, before the holidays, the fleet on the country routes bearing a coloured representation of the "Blue Bird" placed before a printed statement of the route traversed. The result was that thousands of children informed their parents that "Blue Bird

"Blue Bird" Label for Country Routes.

'Buses" were running, and that they wanted to be taken for a trip during the holidays. Favoured by fine weather, the "people's motors" transported a record number of passengers to the rural beauty spots and back to their homes without an accident. These routes now extend as far as thirty miles, offering a rivalry to railways that was scarcely dreamed of a decade ago. During the holiday the fleets, north, south, west, and east, were augmented to any extent with the greatest ease, thanks to the manner in which the directing staff and the employees laid themselves out to serve the public. All grades are to be congratulated on the great efficiency which was displayed. Another such triumph was achieved on Derby Day, when a very great number of omnibuses were engaged by private parties to go to Epsom. The occupants of these "travelling grand stands" had the best view of everything, both on the course and on the road.

Ambulances for Hospitals.—The Hon. Sir Arthur Stanley, chairman of the Home Service Ambulance Committee of the British Red Cross Society and the Order of St. John, states that during the past twelve months the committee established over 300 motor ambulance stations throughout the country. That the need existed for an efficient ambulance service even before the establishment of the system of linked hospitals foreshadowed in the report, is shown by the fact that though a large proportion of the ambulances have been in service for only a few months, they have already been the means of transporting over 12,000 cases. The administration of our ambulances has been delegated through county directors to local organisations or public health authorities as circumstances dictated, but central control of the service is maintained at headquarters. We are thus in a position to develop and extend the scheme on such lines as may prove most desirable to meet the needs of a co-ordinated health service.

MOTOR VEHICLES FOR MUNICIPALITIES.

Teddington Urban Council have applied for a loan of £1,353 for purchasing a steam tipping wagon.

Bolton Cleansing Committee have referred to the chairman and vice-chairman the question of the purchase of motor wagons for removal of refuse.

Central Garage for Durham.—Durham County Council suggest the acquisition, at a cost of £2,500, of Peele's Yard for the purpose of a central garage and depot.

Glasgow tramways manager has been requested by the Corporation to obtain quotations for the supply of a new car of suitable type for the use of the Lord Provost.

Bolton Electricity Committee have authorised the chairman and vice-chairman to purchase a motor vehicle for the fittings department and a car for the supply department.

Hull Corporation have accepted the tender of Auto-Traders, Limited, for three reconstructed A.E.C. 3½ to 4 ton lorries, with W.D. subsidy bodies, at £775 each, with new tires.

The Health Ministry have sanctioned Lytham Council borrowing £847 for a motor wagon, Runcorn Council £377 for a motor lorry, and Oxford Council £2,770 for a fire engine.

Glasgow Corporation have had offered three new Crossley motor cars, War Office pattern, at £1,275 each. The garage committee have been asked to report on the suitability of the vehicles

Municipal Motor Drivers' Wages.—A conference of London Borough Councils have decided that the wages of motor drivers (all types carrying out running repairs) shall be £4 6s. 2d. per week of 47 hours.

Walthamstow Council are in need of lorries. Early in May the surveyor reported that he had made inquiries of the various Government departments with respect to the purchase of additional lorries, but without success.

Plymouth Corporation have accepted the tender of Edison Accumulators, Limited, for two 2-ton electric vehicles for £1,500 each, and of Messrs. Ransomes, Sims and Jeffries, Limited, for one 3½-ton electric vehicle of £1,725 10s. Four 5-ton steam wagons are to be obtained from Mann's Steam Wagon Company at £1,305 each.

NAPIER TIPPING WAGON.

A feature of the advance of motor traction since the war is the manner in which mechanical aids to speedy loading and unloading are being applied to the lightest vehicles. At one time only industrial machines were fitted with a tipping arrangement. Now

Tipping Body on a 2-ton Napier Chassis.

the Napier 2-ton business vehicle can be obtained with a tipping body, as is shown in the illustration above. This product of Messrs. D. Napier and Son's works is very suitable for that type of body, it being easy to control and smooth running, having none of the jerky movement sometimes found in this class of van. A feature of the Napier body is the protection given to the driver by the hood, wind screen, and high side doors.

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MOTOR TRAFFIC.

MOTOR TRAFFIC NOTES.

LUTON-DUNSTABLE OMNIBUS SERVICE.—Hertfordshire County Council propose to allow Road Motors, Limited, to run a service of omnibuses from Luton to Dunstable on condition that the company pay 2d. per omnibus mile.

A CORPORATION'S LIMITATION.—At Rotherham Corporation a letter was received from Greasborough Urban Council asking if arrangements could be made for an omnibus service to Nether Haugh. The Town Clerk stated that the Corporation had no statutory power to promise a service for that district.

USE AND CONTROL OF CORPORATION CARS.—Salford Corporation have appointed a special committee to consider to what use motor cars belonging to the Corporation should be put and their future control. Councillor Owen, who suggested the inquiry, stated that during the last five years £5,700 had been spent in the hire of other vehicles.

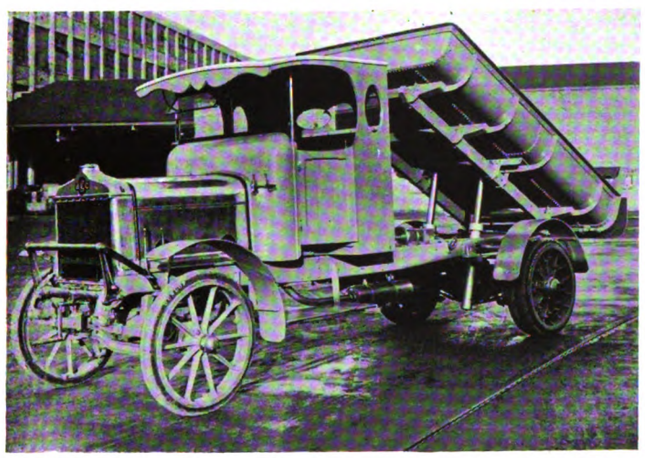
WAYSIDE PETROL TANKS AND PUMPS.—The Anglo-American Oil Company intend to introduce tanks and pumps for the supply of petrol on a large scale. Numerous installations have already been made, the pump being painted green. One class of pump gives delivery into the tank of an automobile in gallons, half-gallons, quarts, or pints.

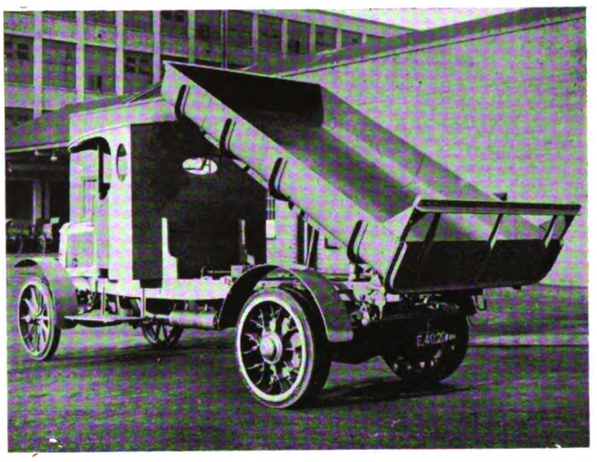
vehicles were to be delivered each week. It is anticipated that the whole number will be delivered before the end of the summer.

MIDDLESEX-HERTS OMNIBUS SCHEME.—Middlesex County Council on April 29 decided to oppose the Hertfordshire County Council Bill, 1920. Sir H. Nield, M.P., chairman of the Parliamentary Committee, stated that the Middlesex Council's scheme for joint management and control of any omnibus undertakings established by the County Councils of Middlesex and Hertfordshire was proceeding satisfactorily, but purely with a view to protection of the county interests.

DUNDEE AND OMNIBUS SERVICES.—The Tramways Committee have appointed a sub-committee to report on the question of inaugurating omnibus services. The Corporation have powers to run such vehicles within the city, but the tramways manager states that outside districts could be served with the sanction of the Ministry of Transport. It is reported that there is a possibility of a company starting services to Longforgen and Birkhill, and of applying to the Ministry for powers to run from the centre of the city.

GOODRICH TIRES.—The catalogue of the B. F. Goodrich Co., Ltd., contains useful information for the users of pneumatic tires, including an illustrated description of the manufacture of the rubber until it is given the tough black tread characteristic of Goodrich products. Seventy-five per cent. of pneumatic tire troubles are





A.E.C. Hydraulic Tipping Wagon with All-Metal Body of 100 Cubic Feet Capacity.

DURHAM COUNTY COUNCIL suggest, in connection with the provision of motor cars for medical officers, that where such officers provide their own vehicles the Council should advance them the purchase price up to £500, repayable in a period of three years, and that the allowance to such officers for running the cars be adjusted accordingly.

CONTROL OF CORPORATION OMNIBUS FARES.—A report presented to Rotherham Corporation by the Town Clerk states that the Ministry of Transport have approved of the revised fares on the omnibuses run by the tramways department, but reserved the power to revise the charges in the event of any objection being hereafter made and sustained.

OMNIBUS AND TRAMWAY SCHEMES IN DURHAM.—Parliamentary powers are to be sought by Durham County Council to run omnibuses and to construct either a tramway or a light railway from Gateshead tramway terminus at Low Fell to Chester-le-Street. Until the result of the application to Parliament is known, no licences will be issued to omnibus companies.

BRADFORD FINANCE COMMITTEE report that after considering representations made by the Lord Mayor with respect to the car provided for his use, the sub-committee appointed the Lord Mayor, the Deputy Lord Mayor, and the chairman and deputy chairman to purchase a new car to be placed absolutely at the Lord Mayor's disposal, with authority to hand over the car now in use in part payment of the purchase price.

EDINBURGH CORPORATION OMNIBUSES.—The Corporation are at present running a dozen single-deck omnibuses. The vehicles are at present being used on an entirely new route within the city, and the receipts average 26d. per omnibus mile. Sixty additional omnibuses have been ordered, and beginning with June 1 four of these

due to overloading, which is simply another word for "undersizing." With an undersized tire there is a lack of resilience and of the air pressure, "which makes the tire truly pneumatic and long-lived." The London headquarters are 117-123, Golden Lane, E.C.

TRAMWAYS AND OMNIBUS EXTENSION AT BLACKBURN.—Blackburn Tramways Committee have decided to obtain expert advice on the extension and development of the tramways. To a suggestion that motor omnibuses should be provided without delay, Mr. C. Higham (chairman of the tramways committee) said it was not the fault of the management that the omnibuses were not running already. They were promoting a Bill in Parliament to secure powers, and he would put no obstacle in the way of a motor omnibus service being established if the necessary powers were obtained.

THE RULE OF THE FOOTPATH.—At the executive committee of the Urban District Councils Association a letter was read from the Ministry of Transport drawing attention to the report of the technical committee appointed by the above Council in favour of the "left-hand rule of the footpath," and asking that the matter might be brought to the notice of Urban District Councils with a view to common action being taken throughout the country. It was resolved "That the committee are in favour of the institution of the left-hand rule of the footpath, and that a copy of the report above referred to be published in the next issue of the official circular with a view to common action being taken by District Councils throughout the country."

NOTTINGHAM'S OMNIBUS SERVICE.—The *Nottingham Journal* hails the introduction of the first municipal omnibus service in Nottingham, which took place on May 17, as the "death sentence of the tramways." The *Journal's* critisicm is, however, not supported by an expert opinion which it obtained from Mr. H. T. Chapman,

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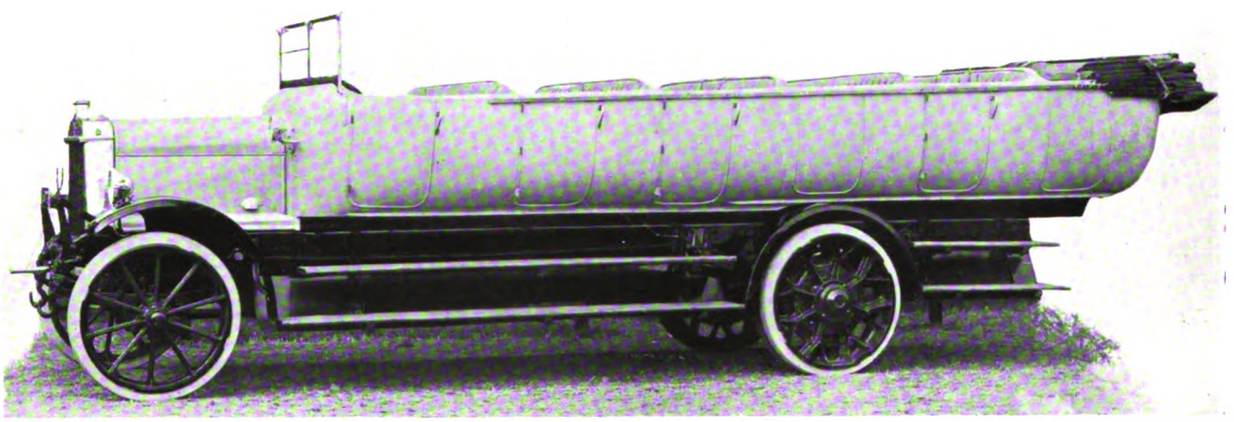
MOTOR TRAFFIC

manager of the omnibus service at West Bridgeford, who remarked that there was much to be said in favour of tramways in the principal thoroughfares of such a city as Nottingham. He did not think they could be dispensed with, but owing to the great expense of tramway track construction to-day he considered that extensions on routes where traffic was not dense would entail either a heavy rate subsidy or prohibitive fares.

ROADS IMPROVEMENT.—Replying to a question in the House of Commons recently, Sir Eric Geddes said that the total amount ear-marked for road improvement after the war was £10,536,000. The sums allocated to highways authorities up to the end of March, 1920, amounted to £10,106,156, leaving an unallocated balance of £429,844. As the work progresses, the highways authorities make requisitions for payment on account against the grants made to them, and up to the end of March payments amounting to £3,437,780 had been made. He was aware that the roads had got into a very bad state during the war, and the general condition of the roads was being considered. The requirements, he hoped, would be provided for by the new motor taxation.

A THORNYCROFT LORRY ON PORLOCK HILL.

The standard of reliable service now attained by the leading makes of motor vehicles almost leads an owner to expect his lorry to go anywhere and do anything in the way of road haulage. Of course there are limitations to a vehicle's working capacity, but one begins to wonder what the limitations of a Thornycroft can be after the experience of a Bristol owner with his Thornycroft lorry.



45-h.p. A.E.C. Char-a-bancs, with Seating Capacity for 30 Passengers.

With a full load of 3 tons 7 cwts. he had recently to make a trip to Pool Farm situated above the famous Porlock Hill in North Devon—a hill which was for many years impassable to touring motor cars until a special road was opened of an easier gradient. Yet the route to Pool Farm necessitated traversing roads that although attempted by many before, had never been successfully negotiated by heavy commercial vehicles. The driver was warned by many people in Porlock that his trip was impossible, but after inspecting his route he decided to take the risk, and so well was his confidence in his Thornycroft vehicle justified that he succeeded, and only found it necessary to use his lowest gear on the last stretch of the hill. Here he found the road covered with snow and had to wrap his tires with rope to prevent a skid which would probably have proved disastrous. Even the descent of the hill on his return journey with the unladen vehicle gave him an anxious time, but he safely arrived back in Porlock, where "Mine Host" of the Ship Hotel took full particulars to add to his list of remarkable performances on this famous hill.

This lorry was one of 5,000 type "J" Thornycrofts supplied to the War Office, and it had already had three years' war service before recently being purchased by Messrs. A. M. Davis & Company, the well-known haulage contractors of Bristol, who are naturally very gratified with its performance throughout this exceptionally severe test.

It is the reserve of power possessed by Thornycroft engines and the sturdiness of the whole chassis which renders Thornycroft vehicles so satisfactory for all-round service, and has gained for them such an excellent reputation among motor vehicle users.

MOTOR PUBLICATIONS.

"THE HEART OF A CAR IS THE ENGINE."—Eighty pages and numerous illustrations make this publication one of great interest. It treats of the Dorman series of engines, twenty pages being an independent and critical review written by Mr. W. Bourdeon, late joint editor of *The Autocar*. Besides meeting the wants of the car manufacturer, Dormans of Stafford produce engines suitable for lorries and vans of 3 tons capacity, including the requirements of the War Office subsidy scheme. Dormans undertook the manufacture of many thousands of the C.C. interrupter gear, which automatically puts 2,000 bullets per minute between the revolving propellor blades of the fighting aeroplanes. This development in the transmission of power and the storage of energy through liquid has, it is claimed, great possibilities for commercial purposes.

WOOD-MILNE TIRES.—Wood-Milne, Limited, rubber and asbestos manufacturers, of 42, 44 and 46, Wigmore Street, W.1., with factories at Leyland and Preston, have issued a brochure containing their price list of motor tires and a collection of the advertisements in which classical pictures were utilised for advertising their wares.

IMPERIAL MOTOR TRANSPORT COUNCIL.

Sir Eric Geddes, Minister of Transport, has consented to become a vice-president of the Imperial Motor Transport Council, and has nominated Sir Henry P. Maybury, Director-General of the Roads Department of the Ministry of Transport, to membership of the Council.

The following nominations to membership of the Council have been made by the War Department:—Major-General Sir E. E. Carter, Director of Supplies and Transport; Brevet Lieut.-Colonel M. S. Brander; Lieut.-Colonel T. M. Hutchinson, Chief Inspector of Mechanical Transport.

Major Stenson-Cooke, Secretary of the Automobile Association and Motor Union, and Mr. H. Percy Boulnois, M.Inst.C.E., Chairman of the Roads Improvement Association, have been elected members of the Council.

THE INSTITUTE OF TRANSPORT.

At a meeting of the Council held at the Institution of Civil Engineers, Westminster, on May 17, at which Lord Ashfield presided, it was decided to close the first session with an Institute Dinner, to be held at the Royal Automobile Club on Friday, June 25, when the Right Hon. Sir Eric Geddes, Minister of Transport, will preside. Further particulars will be announced shortly.

A Proceedings and Library Committee was appointed and entrusted with an examination of papers to be read at meetings and contributions to proceedings, and to undertake the formation of a library. The Committee is constituted as follows:—Sir J. G. Broodbank, Mr. G. A. Dutfield, Sir J. E. Eaglesome, Sir Sam Fay, Sir Maurice Fitzmaurice, Mr. H. H. Gordon, Mr. R. J. Howley, Sir Henry Maybury, Mr. Sidney Preston, Mr. F. Tatlow, and the Honorary Secretary.

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Contents, Page xi.
Index to Advertisements, Page xiii.

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Contents, Page xi.
Index to Advertisements, Page xiii.

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Contents, Page xi.
Index to Advertisements, Page xiii.

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Contents, Page xi.
Index to Advertisements, Page xiii.

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WITH
"MOTOR TRAFFIC" SECTION

Contents, Page xi.
Index to Advertisements, Page xiii.

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Contents, Page xi.
Index to Advertisements, Page xiii.

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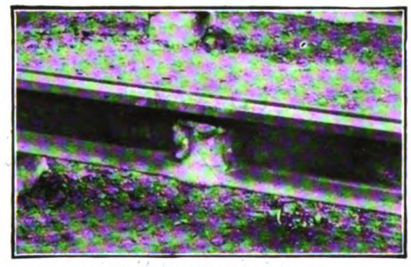

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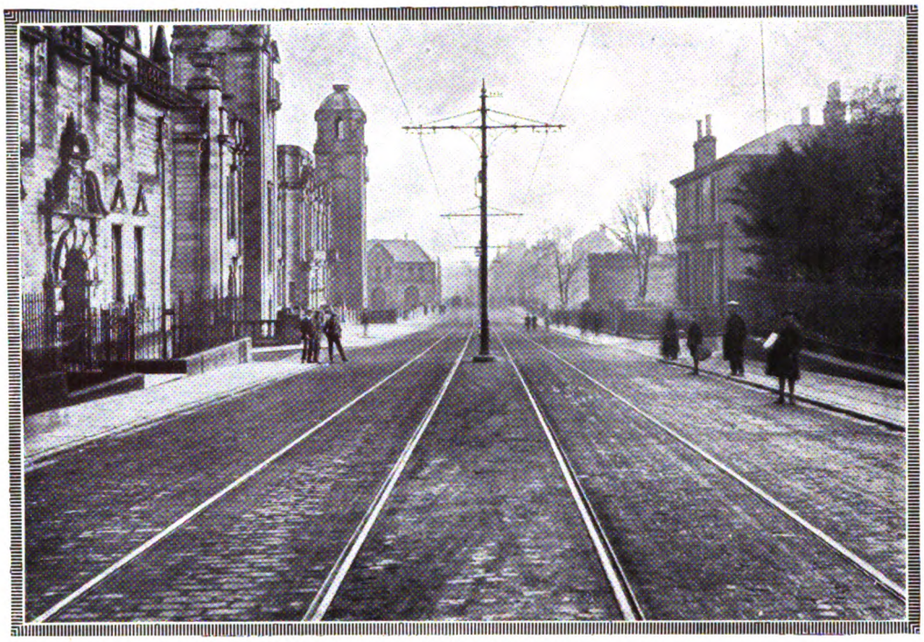

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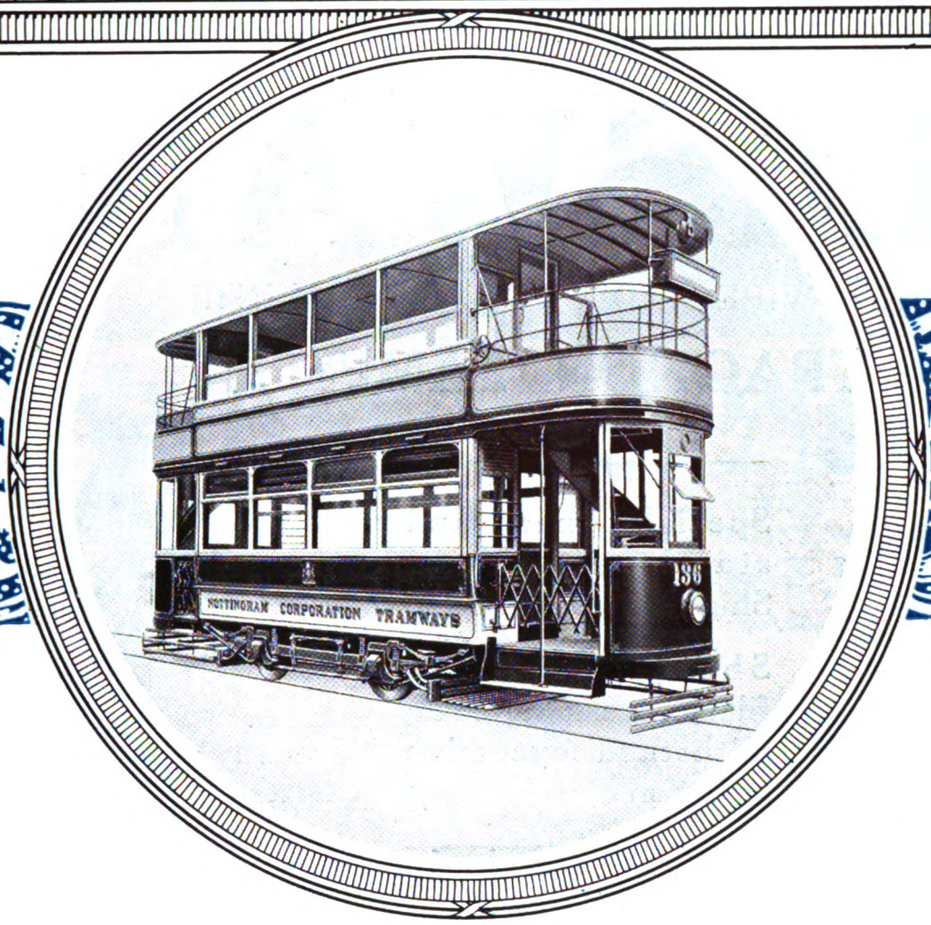

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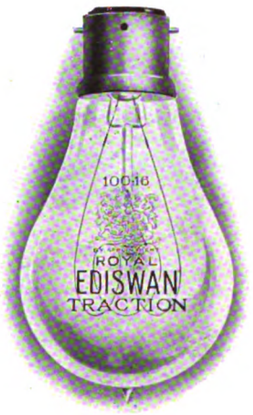

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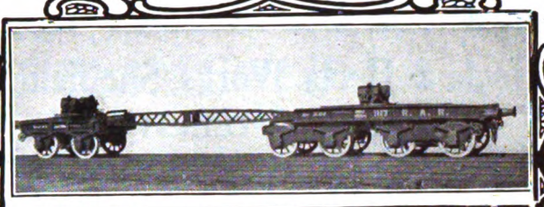

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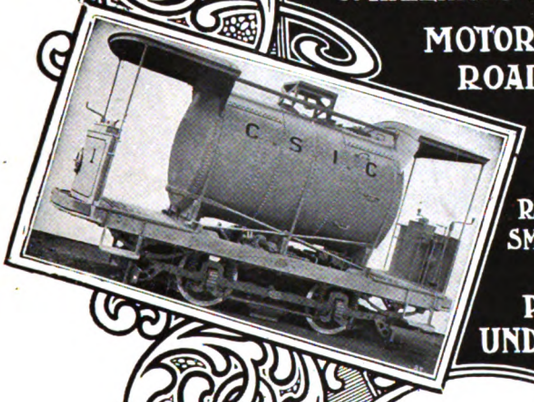

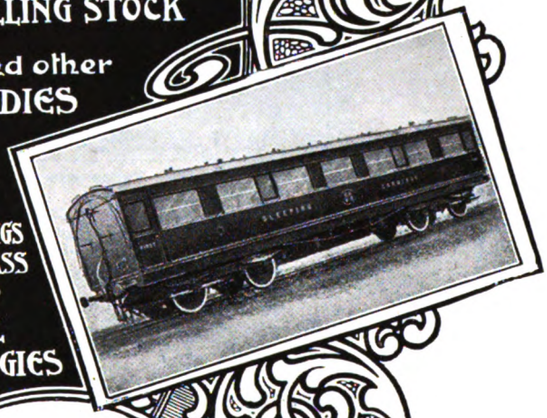

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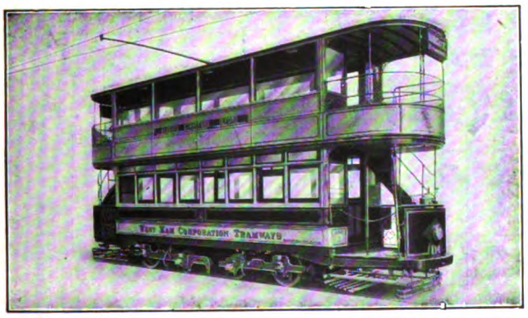

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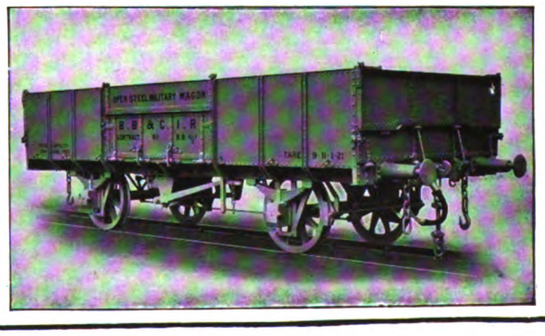

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CONTENTS

	Page
Last Stand of the Reciprocating Steam Engine (Illus.)	301
New Rolling Stock for Bakerloo (Illus.)	309
Electric Welding in Building Construction	311
Glasgow Fare Increases	311
Shanghai Tramways	312
Rails for Dundee	313
The Dick-Kerr Works at Preston	313
Editorial Comments—Tramway Statistical Returns	314
Railway Electrification	314
Electric Power Development	315
Failure of the Swansea Strike	315
The Grading Principle Recognised	316
Big Railway Termini and Electric Traction	316
London's Traffic Problem	317
Financial Position of American Public Utilities	319
Tramways Act, 1920	320
London United Tramway Fares	320
Wages Negotiations	321
Financial Reports and Meetings	323
Bristol Tramways Company	324
Glasgow Tramways Year	324
London Traffic Report	324
Personal	325
Tramway and Light Railway Notes	325
Tramways and Light Railways Association	326
Contracts and Orders	326
Business Notices	326
Patent List	327
MOTOR TRAFFIC SECTION	331
Plymouth's Omnibus Selection (Illus.)	334
Thornycroft Achievements	336
Seeing Britain by Modern Coaching (Illus.)	337
Government Motor Cars	337
Triumph of the "Blue Bird" 'Bus (Illus.)	338
Motor Vehicles for Municipalities	338
Napier Tipping Wagon (Illus.)	338
Motor Traffic Notes (Illus.)	339
A Thornycroft Lorry on Porlock Hill	340
Traffic Returns	328
Directories of Electric Tramways and Railways	xxiii-xxviii
Municipal Tramways	xxiii-xxiv
Company Tramways	xxiv-xxviii
Tramway Associations	xxviii
Buyers' Guide	xvi-xx
Index to Advertisements	xiii

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INDEX TO ADVERTISEMENTS

	PAGE
Abbott, Anderson & Abbott Ltd., London	xiv
Aerograph Co. Ltd., The, London, E.C.	xlix
Albion Motor Car Co. Ltd., Scotstoun, Glasgow	xv
Allen, Edgar & Co., Ltd., Sheffield	**146**
Allen & Simmonds, Ltd., Reading	**136**
Armstrong, Stevens & Son, Ltd., Birmingham	**147**
Art Reproduction Co., London	**144**
Associated Equipment Co. Ltd., London, E.	**117**
Attwater & Sons, Preston	xvi, 327
Austin Motor Co. Limited, Birmingham	—
Auto-Ticket Printing Co. Ltd., Liverpool	xlix
Avon India Rubber Co. Ltd., London	**128**
Baker, John & Co. (Rotherham), Ltd., Rotherham	xxii
Bates, W. & A., Ltd., St. Mary's Mills, Leicester	**143**
Bayliss, Jones & Bayliss, Ltd., Wolverhampton	—
Beckett, Laycock & Watkinson, Ltd., Willesden	xx
Bell Punch and Printing Co. Ltd., London, E.C.	**144**
Bennis, Ed. & Co. Ltd., Bolton and London, S.W.	ii
Birch Bros., Ltd., London, N.W.	**130**
Blackwell, Robert W. & Co., Ltd., London	xxv, xxvi
Brecknell, Munro & Rogers, Ltd., Bristol	xxxiii
Brill Company, J. G., London, E.C.	li
British Aluminium Co. Ltd., London	xiii
British Insulated & Helsby Cables, Ltd., Prescot	xxix
British Motor Trading Corporation, Ltd., London	**138**
British Reinforced Concrete Engineering Co. Ltd., Manchester	iv
British Thomson-Houston Co. Ltd., Rugby	xxxvi
Brockhouse, J. & Co. Ltd., West Bromwich	**145**
Brown, David & Sons, Ltd., Lockwood, Huddersfield	**134**
Brown John & Co. Ltd., Sheffield	xlii
Brush Elec. Eng. Co. Ltd., Loughborough	xxxviii, xxxix
Burford, H. G. & Co. Ltd., London	**127**
Callender's Cable & Construction Co. Ltd., London	xxxv
Cammell Laird & Co., Ltd., Sheffield	i
Carbic, Ltd., London, E.C.	xxxvi
Chamberlain & Hookham Ltd., Birmingham	xlvii
Chamberlins Ltd., Norwich	xiv
Chloride Electrical Storage Co. Ltd., Manchester	**134**
Clough, Smith & Co. Ltd., London, S.W.	**145**
Coan, R. W., 219, Goswell Road, London, E.C.	xviii
Cole, Wm. & Sons, Ltd., London, W.	**142**
Consolidated Construction Co. Ltd., London	xlii
Courtenay, J. W., Ltd., London, W.C.	xxx
Daimler & Co. Ltd., Coventry	329
Dennis Bros., Guildford	**116**
Dick, W. B. & Co. Ltd., 90, Fenchurch St., E.C.	**136**
Docker Brothers, Ltd., London, E.C.	**144**
Dodson, Christopher, Ltd., Willesden, N.W.	**121**
Duff Jack Sales Co., London, W.	xlviii

	PAGE
Dunlop Rubber Co. Ltd., Aston Cross, Birmingham	**131**
Edison Swan Electric Co. Ltd., Ponders End	viii
Electro-Mechanical Brake Co. Ltd., West Bromwich	lii
Empire Roller Bearings Co. Ltd., London, S.W.	xiv, xlix
English Electric Company, Ltd., London, E.C.	vi, vii, **148**
English Electric Supplies, Ltd., London, W.	—
Equipment & Engineering Co., London	xl, xli
Eyre Smelting Co. Ltd., London, S.W.	xlv
Ferodo Ltd., Chapel-en-le-Frith	**147**
Fleming, Birkby & Goodall, Ltd., Liversedge	xxi
Fraser & Chalmers, Engineering Works, Erith	xlvii
Fodens, Ltd., Sandbach	**123**
General Electric Co. Ltd., London, E.C.	xxxvii
General Seating Co. Ltd., London, E.C.	**132, 133**
Glasgow Numerical Ticket Printing Co., Glasgow	xxxii
Goodrich Co., B. F., Ltd., London, E.C.	**141**
Green, Geo. W. & Co. (Feltham) Ltd., Feltham	**147**
Grover & Co. Ltd., Stratford, London, E.	xxxii
Hadfields, Ltd., Sheffield	x
Halley's Industrial Motors, Ltd., Glasgow	**126**
Hatcham Manufacturing Co. Ltd., London, W.C.	327
Hays, Hunter & Standen, Ltd., London, S.E.	xi
Henley's Telegraph Works Co. Ltd., London, E.C.	xix
Henley's Tyre and Rubber Co. Ltd., London, E.C.	**120**
Hora, E. & H., Ltd., 36, Peckham Road, London	**125**
Hurst, Nelson & Co. Ltd., Motherwell	ix
Johnson & Phillips, Ltd., London, S.E.	lii
Kalker, E. & Co., Coventry	xxxiv
Kearsley, Robert & Co., Ltd., Ripon	xviii
Leyland Motors (1914) Ltd., Leyland	**135**
London & Midland Motors, Ltd., London, W.	**122**
Lorain Steel Co., London, E.C.	v
Macintosh Cable Co. Ltd., Derby	xliii
Macintosh, Chas. & Co. Ltd., Manchester	**118**
Maudslay Motor Co. Ltd., 4, Parkside, Coventry	**137**
Metropolitan-Vickers Electrical Co., Ltd., Manchester	xix
Motor Rail and Tramcar Co. Ltd., Bedford	xlv
Motor Traction, 20, Tudor Street, London, E.C.	xviii
Napier, D. & Son, Ltd., London, W.	330
Northern Ball Bearings, Ltd., London	xliv
North British Rubber Co. Ltd., Edinburgh	—
Pease & Partners, Ltd., Middlesbrough	xxii
Peckham Truck & Engineering Co. Ltd., London	xvii
Pinchin, Johnson & Co. Ltd., London, E.C.	xxxiv
Pirelli-General Cable Works, London, E.C.	xxxvii
Plumpton, Herbert, Ltd., Warrington	xlvi
Quasi-Arc Co. Ltd., London, E.C.	xxxii
Railless Ltd., 56, Moorgate Street, London, E.C.	xxxi
Rail Welding Co., London, S.W.	xii

Continued on page xiv.

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Index to Advertisements—*continued.* PAGE

Scholey & Co. Ltd., London, S.W. xlvi
Shrewsbury & Challiner Tyre Co. Ltd., Manchester ... 124
Smith, Frederick & Co. Ltd., Salford, Manchester —
Smith, S. & Sons, London, W.... 140
Spencer-Moulton & Co. Ltd., London, W. 139
Standard Underground Cable Co., London, E.C. ... xvi
Stevens Petrol-Electric Vehicles, Ltd., London, S.W. 129
Stewarts & Lloyds, 41, Oswald Street, Glasgow ... 145
Straker-Squire, Ltd., London, S.E. 119
Terry, Herbert & Sons, Ltd., Redditch xxxiv
Thermit, Ltd., London, E.C. iii
Thornycroft, John I. & Co. Ltd., London 126
Tilling-Stevens, Ltd., Victoria Works, Maidstone ... 115
Titan Trackwork Co. Ltd., Sheffield xv
Tyne Metal Co. Ltd., Newcastle-upon-Tyne ... 145
Underground Electric Rly. Co. Ltd., London ... xlix
Vandervell, C. A. & Co. Ltd., London, W. ... ... —
Western Electric Co. Ltd., North Woolwich —
Williamson, Alfred, Ashton-under-Lyne xxxi
Williams & Pell, 5, Chancery Lane, London, W.C.... xvi
Wiseman, Alfred, Ltd., Glover Street, Birmingham xii
Woods Gilbert Rail Remodelling Co. Ltd., London xxxiii
Wood-Milne, Ltd., Preston 139
Yates, John & Co. Ltd., Aston, Birmingham ... xxxv

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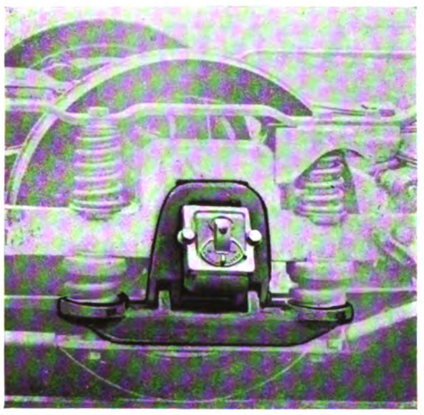

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PAINT.
Docker Bros., Ltd., London.
Kearsley, Robert, & Co., Ltd., Ripon, Yorks.

PANELS, ALUMINIUM.
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PERMANENT WAY TOOLS.
Allen, Edgar, & Co., Ltd., Sheffield.

PISTON RINGS.
Allen & Simmonds, Ltd., Reading.

POINTS AND CROSSINGS.
Allen, Edgar, & Co., Ltd., Sheffield.
English Electric Co., Ltd., London, W.C.
Hadfields, Ltd., Sheffield.
Lorain Steel Company, London.
Titan Trackwork Co., Ltd., Sheffield.

POINT CONTROLLERS.
Equipment & Engineering Co., London, W.C.
Tramway Supplies, Ltd., Leeds.

POLES, METAL.
Britannia Lamp & Accessories Co., E.C.
English Electric Co., Ltd., London, W.C.
Equipment & Engineering Co., London, W.C.
Stewarts & Lloyds, Ltd., Glasgow.
Tramway Supplies, Ltd., Leeds.

PRESSWORK PARTS.
Terry & Sons, Ltd., Herbert, Redditch.

PUBLIC SERVICE VEHICLES.
Clayton & Co Huddersfield, Ltd., Huddersf'ld.

PULLEYS, SHAFTING, COUPLINGS, etc.
Allen, Edgar, & Co., Ltd., Sheffield.
Hadfields, Ltd., Sheffield.
Tyne Metal Co., Ltd., Hexham-on-Tyne.

PUNCHES, TICKET.
Auto-Ticket Printing Co., Ltd., Liverpool.
Bell Punch & Printing Co., Ltd., London.
Williamson, Alfred, Ashton-under-Lyne.

RAIL BENDERS.
Anger Manufacturing Co., Ltd., Preston
Equipment & Engineering Co., London, W.C.
Hadfields, Ltd., Sheffield.
Yates & Co., Ltd., John, Aston Manor.

RAIL BONDS.
Anger Manufacturing Co., Ltd., Preston.
Britannia Lamp & Accessories Co., Ltd., E.C.
Equipment & Engineering Co., London, W.C.
Tramway Supplies, Ltd., Leeds.

RAIL CLEANERS.
Anger Manufacturing Co., Ltd., Preston.
Brill Company, J. G., London, E.C.
Britannia Lamp & Accessories Co., Ltd., E.C.
Equipment & Engineering Co., London, W.C.
Green, Geo. W., & Co., Ltd., Feltham.

RAIL GRINDERS.
Anger Manufacturing Co., Ltd., Preston.
Equipment & Engineering Co., London, W.C.
Thermit, Ltd., London, E.C.
Tramway Supplies, Ltd., Leeds.
Woods-Gilbert Rail Remodelling Co., London

RAIL JOINTS.
Hadfields, Ltd., Sheffield.
Rail Welding Co., London, W.
Thermit, Limited, London, E.C.
Woods-Gilbert Rail Remodelling Co., London

RAILLESS ELECTRIC SYSTEMS.
English English Co., Ltd., London, W.C.
Tramway Supplies, Ltd., Leeds.

(Continued on page xx.)

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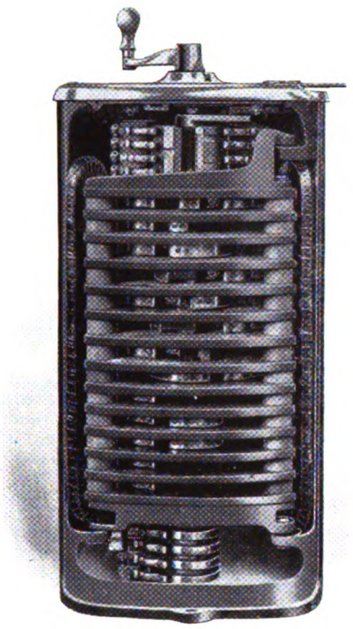
TRAMWAY CONTROLLERS



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RAIL PLANES.
Thermit, Ltd., London, E.C.
Woods-Gilbert Rail Remodelling Co., London

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Allen, Edgar, & Co., Ltd., Sheffield.
English Electric Co., Ltd., London, W.C.
Hadfields, Ltd., Sheffield.
Lorain Steel Company, London.
Titan Trackwork Co., Ltd., Sheffield.

RAILWAY AND TRAMWAY MOTORS, ELECTRIC.
Brill Company, J. G., London, S.W.
British Thomson-Houston Co., Ltd., Rugby.
English Electric Co., Ltd., London, W.C.
Metropolitan-Vickers Elec. Co., Manchester.

RAILWAY STORES.
General Seating Co., Ltd., London, S.W.
Yates & Co., Ltd., John, Aston Manor.

RATTAN.
Anger Manufacturing Co., Ltd., Preston.
Brill Company, J. G., London, E.C.
General Seating Co., Ltd., London, S.W.

RESISTANCES.
Electro-Mechanical Brake Co., W. Bromwich.
English Electric Co., Ltd., London, W.C.

SANDING DEVICES.
Equipment & Engineering Co., London, W.C.
Tramway Supplies, Ltd., Leeds.

SAND BOXES.
Brill Company, J. G., London, S.W.
English Electric Co., Ltd., London, W.C.
Tramway Supplies, Ltd., Leeds.

SEATS AND SEATING MATERIALS.
Brill Company, J. G., London, E.C.
English Electric Co., Ltd., London, W.C.
Equipment & Engineering Co., London, W.C.
General Seating Co., Ltd., London, S.W.

SIDE GUARDS.
Anger Manufacturing Co., Ltd., Preston.
Equipment & Engineering Co., London, W.C.

SIMPLEX JACKS.
Anger Manufacturing Co., Ltd., Preston.
Equipment & Engineering Co., London, W.C.

SNOW PLOWS.
Brill Company, J. G., London, S.W.

SPRINGS.
Allen, Edgar, & Co., Ltd., Sheffield.
Anger Manufacturing Co., Ltd., Preston.
Brill Company, J. G., London, E.C.
Hadfields, Ltd., Sheffield.
Terry & Sons, Ltd., Herbert, Redditch.

SPRINGS (LAMINATED AND SPIRAL.)
Brockhouse, J., & Co., Ltd., West Bromwich.

SPRINKLING CARS.
Brill Company, J. G., London, S.W.
English Electric Co., Ltd., London, W.C.

STEAM TURBINES.
British Thomson-Houston Co., Ltd., Rugby.
English Electric Co., Ltd., London, W.C.
Fraser & Chalmers Engineering Works, Erith.
Metropolitan-Vickers Elec. Co., Manchester.

STEAM WAGONS.
Leyland Motors, Ltd., Leyland, Lancs.

STEEL FORGINGS.
Allen, Edgar, & Co., Ltd., Sheffield.
Baker, John, & Co., Rotherham.
Brill Company, J. G., London, E.C.
Brockhouse, J., & Co., Ltd., West Bromwich.
Electro-Mechanical Brake Co., W. Bromwich.
Hadfields, Ltd., Sheffield.

STEEL STRUCTURAL WORK.
Allen, Edgar, & Co., Ltd., Sheffield.

STEPS. (See Movable Car Steps.)

STONEBREAKERS
Allen, Edgar, & Co., Ltd., Sheffield.
Hadfields, Ltd., Sheffield.

STRAIN WIRE
Anger Manufacturing Co., Ltd., Preston.
Britannia Lamp & Accessories Co., Ltd., E.C.
Equipment & Engineering Co., London, W.C.
Fleming, Birkby & Goodall, Ltd., Liversedge.
Tramway Supplies, Ltd., Leeds.

SWEEPERS.
Brill Company, J. G., London, S.W.
English Electric Co., Ltd., London, W.C.

SWITCHBOARDS AND GEAR.
British Thomson-Houston Co., Rugby.
Edison Swan Electric Co., Ltd., Ponders End, Middlesex.
English Electric Co., Ltd., London, W.C.
Johnson & Phillips, Ltd., Charlton, S.E.
Metropolitan-Vickers Elec. Co., Manchester.
Tramway Supplies, Ltd., Leeds.

SWITCHES, ELECTRICAL.
British Thomson-Houston Co., Ltd., Rugby.
Edison Swan Electric Co., Ltd., Ponders End, Middlesex.
English Electric Co., Ltd., London, W.C.
Johnson & Phillips, Ltd., Charlton, S.E.
Tramway Supplies, Ltd., Leeds.

THIRD-RAIL INSULATORS.
Britannia Lamp & Accessories Co., Ltd., E.C.
Fleming, Birkby & Goodall, Ltd., Liversedge.
Wiseman, Alfred, Ltd., Birmingham.

THREE-PLY VENEER.
Equipment & Engineering Co., London, W.C.

TICKET PUNCHES. (See Punches).

TIME INDICATORS.
General Seating Co., Ltd., London, S.W.

TIRES.
Allen, Edgar, & Co., Ltd., Sheffield.
Baker, John, & Co., Rotherham.
Equipment & Engineering Co., London, W.C.
Hadfields, Ltd., Sheffield.
Macintosh & Co., Ltd., Chas., London, E.C.

TOWER WAGONS.
Britannia Lamp & Accessories Co., Ltd., E.C.
Clayton & Co. Huddersfield, Ltd., Huddersf'ld.
Commercial Cars, Ltd., Luton.
Equipment & Engineering Co., London, W.C.
Leyland Motors, Ltd., Leyland, Lancs.
Tramway Supplies, Ltd., Leeds.

TRACK BRAKES.
Anger Manufacturing Co., Ltd., Preston.
Brill Company, J. G., London, S.W.
Electro-Mechanical Brake Co., W. Bromwich.

TRACK BRAKES (*continued*).
English Electric Co., Ltd., London, W.C.
Equipment & Engineering Co., London, W.C.
Tramway Supplies, Ltd., Leeds.

TRACK SANDERS.
Anger Manufacturing Co., Ltd., Preston.
Brill Company, J. G., London, S.W.
Tramway Supplies, Ltd., Leeds.

TRACK TOOLS AND APPLIANCES.
Allen, Edgar, & Co., Ltd., Sheffield.
Britannia Lamp & Accessories Co., Ltd., E.C.
Green, Geo. W., & Co., Ltd., Feltham.
Plumpton, Herbert, Ltd., Warrington.
Yates & Co., Ltd., John, Aston Manor.

TRAMWAY FOUNDATIONS.
British Reinforced Concrete Engineering Co., Ltd., Manchester.

TROLLEY CORD.
Britannia Lamp & Accessories Co., Ltd., E.C.
Equipment & Engineering Co., London, W.C.

TROLLEY HANGERS.
Anger Manufacturing Co., Ltd., Preston.
Britannia Lamp & Accessories Co., Ltd., E.C.
Equipment & Engineering Co., London, W.C.
Fleming, Birkby & Goodall, Ltd., Liversedge.
Metropolitan-Vickers Elec. Co., Manchester.
Tramway Supplies, Ltd., Leeds.
Wiseman, Alfred, Ltd., Birmingham.

TROLLEY SPINDLES.
Fleming, Birkby & Goodall, Ltd., Liversedge.
Tramway Supplies, Ltd., Leeds.
Wiseman, Alfred, Ltd., Birmingham.

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Britannia Lamp & Accessories Co., Ltd., E.C.

TROLLEY TENSION INDICATOR.
Britannia Lamp & Accessories Co., Ltd., E.C.
Plumpton, Herbert, Ltd., Warrington.

TROLLEY WHEELS AND HEADS.
Anger Manufacturing Co., Ltd., Preston.
Britannia Lamp & Accessories Co., Ltd., E.C.
British Aluminium Co., Ltd., London, E.C.
British Thomson-Houston Co., Ltd., Rugby.
Electro-Mechanical Brake Co., W. Bromwich.
Fleming, Birkby & Goodall, Ltd., Liversedge.
Tramway Supplies, Ltd., Leeds.
Wiseman, Alfred, Ltd., Birmingham.

TROLLEY WIRE.
Anger Manufacturing Co., Ltd., Preston.
Britannia Lamp & Accessories Co., Ltd., E.C.
Equipment & Engineering Co., London, W.C.
Frederick Smith & Co., Salford, Manchester
Standard Underground Cable Co., London.
Tramway Supplies, Ltd., Leeds.

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Anger Manufacturing Co., Ltd., Preston.
Brill Company, J. G., London, E.C.
English Electric Co., Ltd., London, W.C.
Peckham Truck & Eng. Co., London, S.W.
Tramway Supplies, Ltd., Leeds.

TRUCKS, CAR.
Brill Company, J. G., London, S.W.
Electro-Mechanical Brake Co., W. Bromwich.
English Electric Co., Ltd., London, W.C.
Lorain Steel Company, London.

VARNISHES.
Docker Bros., Ltd., London.
Fleming, Birkby & Goodall, Ltd., Liversedge.
Pinchin, Johnson, & Co., Ltd., London, E.C.

WASHERS.
Terry & Sons, Ltd., Herbert, Redditch.

WELDED JOINTS.
Rail Welding Co., London, W.
Thermit, Limited, London, E.C.
Woods-Gilbert Rail Remodelling Co., London

WHEELS AND AXLES.
Allen, Edgar, & Co., Ltd., Sheffield.
Baker, John, & Co., Rotherham.
Brill Company, J. G., London, S.W.
Equipment & Engineering Co., London, W.C.
Hadfields, Ltd., Sheffield.

WHEELS WITH WROT IRON CENTRES.
Anger Manufacturing Co., Ltd., Preston.
Baker, John, & Co., Rotherham.

WHITE METAL FOR BEARINGS.
Hoyt Metal Co., Ltd., London, W.

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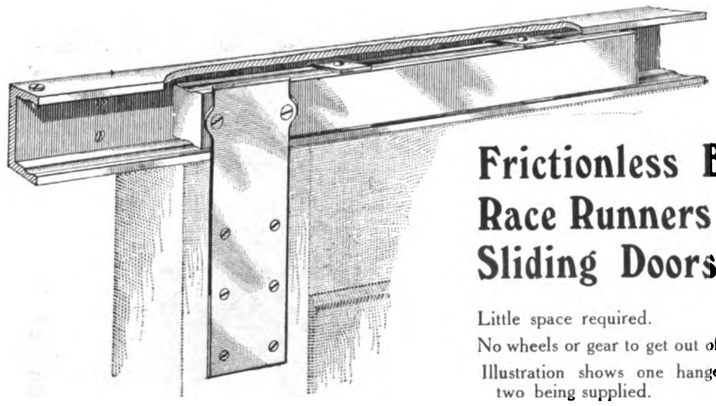
British Aluminium Co., Ltd., London, E.C.

WIRE, COPPER.
Britannia Lamp & Accessories Co., Ltd., E.C.
Henley's Telegraph Works Co., Ltd., London.
Smith, Frederick, & Co., Salford, Manchester.
Standard Underground Cable Co., London.

WIRE ROPES.
Britannia Lamp & Accessories Co., Ltd., E.C



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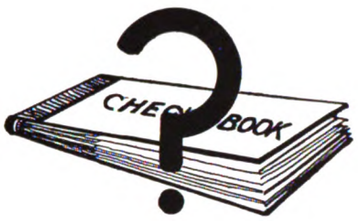

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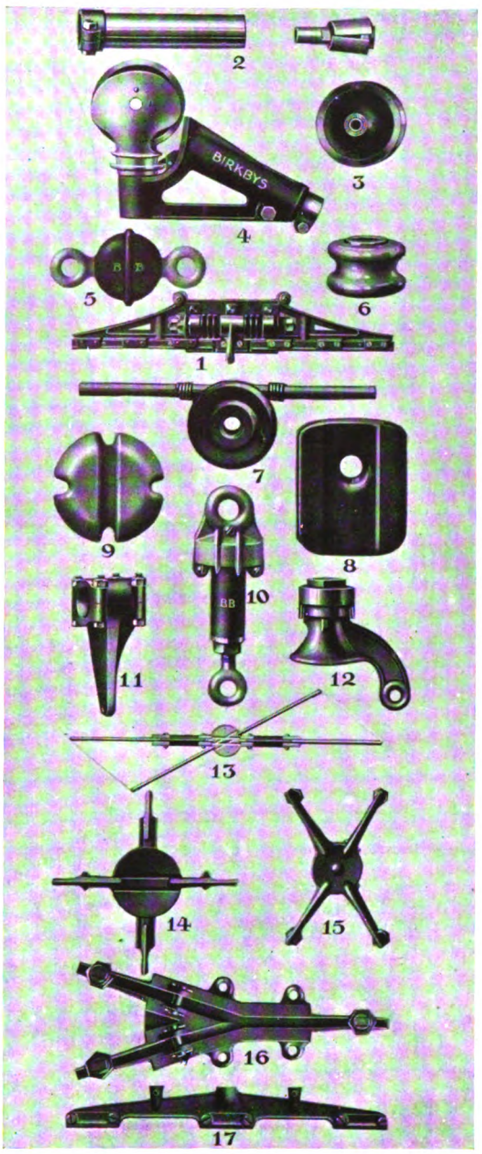

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DIRECTORIES OF ELECTRIC TRAMWAYS
IN THE UNITED KINGDOM

Municipal Tramways pp. xxiii-xxiv. Company Tramways pp. xxiv-xxviii. Tramway Associations p. xxviii.

NAMES OF PRINCIPAL OFFICERS
POSTAL ADDRESS, TELEGRAPHIC ADDRESS, AND TELEPHONE NUMBERS

*** **In order that these Directories may be kept up to date, it is specially requested that intimation of all changes be sent promptly.**

Aberdare Urban District Tramways, Gadlys Estate, Aberdare. [T.A., Tramways, Aberdare: T.N., 17.] *Gen. Manager and Elec. Engineer*, A. J. Abraham; *Traffic Supt.*, H. King; *Chairman Try. Com.*, Coun. E. Stonelake.

Aberdeen Corporation Tramways, Municipal Buildings, Union Street, Aberdeen. [T.A., Trams, Aberdeen; T.N. 826.] *Gen. Manager and Eng.*, W. Forbes; *Per. Way Eng.*, J. Gordon (*Burgh Surveyor*); *Chairman Try. Com.*, Coun. D. W. Beaton.

Accrington Corporation Tramways, Market Hall, Accrington. [T.A., Trams, Accrington; T.N., 2212.] *Gen. Manager and Eng.*, H. Pilling; *Per. Way Eng.*, W. J. Newton; *Chairman Try. Com.*, Ald. T. E. Higham; *Vice-Chairman*, Coun. F. Lord.

Ashton-under-Lyne Corporation Tramways, Tramway Depot, Mossley Road, Ashton. [T.A., Tramways, Ashton; T.N., 325.] *Gen. Manager*, Ernest Holt; *Elec. Eng.*, N. Appelbee; *Chairman Try. Com.*, Ald. R. S. Oldham; *Vice-Chairman*, Ald. C. H. Waterhouse.

Ayr Corporation Tramways, Town Building, Ayr. [T.A., Trams, Ayr; T.N., 123.] *Gen. Manager and Eng.*, William Grant; *Burgh Elec. Eng.*, R. Marshall; *Per. Way Eng.*, John Young; *Rolling Stock Supt.*, Alf. Somerville; *Convener Try. Com.*, Bailie J. R. Learmont; *Vice-Chairman*, Bailie T. Murray.

Bacup Corporation Tramways.—Town Hall, Bacup, Lancs. [Lines leased to and worked by Rawtenstall Corporation.] *Town Clerk*, J. Entwistle; *Boro' Eng.*, G. Bradley; *Chairman Try. Com.*, Coun. S. McLerie; *Vice-Chairman*, Coun. J. H. Lord.

Barking Town Urban District Tramways, East Street, Barking. [T.N., 156 East Ham.] *Eng. and Manager*, W. Holmes; *Acting Engineer and Manager*, W. E. Kidner; *Chairman Try. Com.*, Coun. Whiting

Barrow Corporation Tramways, Salthouse Road, Barrow-in-Furness. *Manager*, J. R. Groves.

Barton-upon-Irwell District Council Light Railways, Barton-upon-Irwell.
[Line leased to and worked by the Lancashire United Tramways Co., *q.v.*]

Batley Corporation Tramways, Batley, Yorks. *Engineer*, S. D. Jones; *Chairman Try. Com.*, Coun. F. W. H. Auty; *Vice-Chairman*, Coun. J. E. Oldroyd.
[Lines leased to and worked by the Yorkshire (Woollen District) Electric Tramways, Ltd., *q.v.*]

Belfast City Tramways, Tramways Office, Sandy Row, Belfast. [T.A., Tramways, Belfast; T.N., 2444.] *Gen. Manager*, J. S. D. Moffet; *Traffic Manager*, R. McMaster; *City Elec. Eng.*, T. W. Bloxam; *Per. Way Eng.*, E. S. Pinkerton; *Chief Eng.*, H. Vernon; *Chairman Try. Com.*, Coun. W. C. Turner; *Vice-Chairman*, Coun. J. McDonald.

Bexley Urban District Council Tramways and Dartford Light Railways, Broadway, Bexleyheath, Kent. [T.A., Makin, Tramways, Bexley; T.N., 79.] *Gen. Manager and Elec. Eng.*, J. Makin; *Chairman Try. Com.*, Coun. F. Leonard.

Birkenhead Corporation Tramways, Laird Street, Birkenhead. [T.A., Tramways Manager, Birkenhead; T.N., 1110.] *Gen. Manager*, C. Clarke; *Borough Sur. and Eng.*, C. Brownridge; *Rolling Stock Supt.*, R. Chadwick; *Chairman Try. Com.*, Coun. H. Halsall; *Vice-Chairman*, Coun. F. Tutty.

Birmingham Corporation Tramways, The Council House, Congreve Street, Birmingham. [T.A., Trams, Birmingham; T.N., Central 7,000.] *Gen. Manager*, A. Baker; *Elec. Engineer*, A. C. Baker; *Traffic Supt.*, J. McDonnell; *Per. Way Eng.*, C. E. S. Bill; *Chief Engineer*, R. H. Dickinson; *Car Works Supt.*, T. C. Winfield; *Chairman Try. Com.*, Coun. Lee.

Blackburn Corporation Tramways, Tramways Office, Blackburn. [T.A., Tramways, Blackburn; T.N., 4321.] *General Manager*, J. H. Cowell; *Elec. Eng.*, P. P. Wheelwright; *Traffic Manager*, E. Greek; *Car Shed Supt*, H. W. Seymour; *Chairman Try. Com.*, Coun. C. Higham; *Vice-Chairman*, Ald. W. Thompson.

Blackpool Corporation Tramways, West Caroline Street, Blackpool. [T.N., 67.] *Gen. Manager*, C. Furness; *Traffic Supt.*, C. I. Baker; *Resident Eng.*, F. Field; *Chairman Try. Com.*, Coun. H. Brooks; *Vice-Chairman*, Coun. Lumb.

Bolton Corporation Tramways, Bradshawgate, Bolton. [T.A., Manager, Tramways, Bolton; T.N., 490.] *General Manager*, J. Barnard; *Elec. Eng.*, W. J. H. Wood; *Per. Way Eng.*, E. Ll. Morgan; *Rolling Stock Supt.*, C. Beech; *Chairman Try. Com.*, Coun. J. R. Horrocks; *Vice-Chairman*, Coun. P. Higson.

Bootle Corporation Tramways, Electricity Works, Pine Grove, Bootle. [T.N., 424.] *Elec. Eng.*, T. D. Clothier; *Chairman Try. Com.*, Ald. Booth; *Vice-Chairman*, Coun. Ashton.
[Lines worked by Liverpool Corporation Tramways.]

Bournemouth Corporation Tramways, Tramways Offices, Lansdowne Crescent, Bournemouth [T.A., Tramways, Bournemouth; T.N., 1701.] *General Manager*, I. Bulfin; *Chief Assistant & Elec. Eng.*, H. Vickers; *Traffic Supt.*, G. F. Glass; *Chairman Try. Com.*, Coun. F. J. Bell; *Vice-Chairman*, Coun. J. Wilson.

Bradford Corporation Tramways, Central Office, 7, Hall Ings, Bradford. [T.A., Tramways, Bradford; T.N., 2381 and 2382.] *Gen. Manager*, R. H. Wilkinson; *Asst. Elec. Eng.*, Johnstone Wright; *Traffic Supt.*, T. Stirk; *City Elec. Eng.*, T. Roles; *Chairman Try. Com.*, Ald. Enoch Priestley; *Vice-Chairman*, Coun. I. F. Akeroyd.

Brighton Corporation Tramways, Lewes Road, Brighton. [T.A., Tramways, Brighton; T.N., 353 P.O.] *Eng. & Manager*, William Marsh; *Traffic Supt.*, W. N. Brooks; *Rolling Stock Supt.*, W. Orchard; *Per. Way Eng.*, F. N. Hudson; *Chairman Try. Com.*, Coun. G. E. Deighton.

Burnley Corporation Tramways, Queen's Gate, Burnley. [T.N., 46.] *Gen. Manager*, Henry Mozley; *Boro. Elec. Eng.*, J. E. Starkie; *Boro. Surveyor*, G. H. Pickles; *Chairman Try. Com.*, Coun. E. Heap; *Vice-Chairman*, Coun. Irving.

Burton-on-Trent Corporation Tramways, Guild Street, Burton-on-Trent. [T.N., 202.] *Manager*, A. B. Slater; *Engineer*, T. Hall; *Chairman Try. Com.*, Ald. J. S. Rowland; *Vice-Chairman*, Ald. T. E. Lowe.

Bury Corporation Tramways, Market Place, Bury. [T.N., 26.] *Gen. Manager*, Frank Buckley; *Boro. Elec. Eng.*, S. J. Watson; *Chairman Try. Com.*, Ald. T. S. Collinge, J.P.; *Vice-Chairman*, Coun. Hargreaves.

Cardiff Corporation Tramways, Central Offices, The Hayes, Cardiff. *Gen. Manager*, R. L. Horsfield; T.N., 1211, 1240, 1350, and 377.] *Elec. Eng.*, C. G. M. New; *Traffic Manager*, H. David; *Rolling Stock Supt.*, Jas. Preston; permanent way under supervision of *City Engineer*, E. J. Elford; *Chairman Try. Com.*, Ald. Sir J. W. Courtis, J.P.; *Vice-Chairman*, Ald. R. J. Smith.

Chester Corporation Tramways, Station Road, Chester. [T.N., 166.] *Manager*, W. H. Ellis; *Elec. Eng.*, S. E. Britton; *Per. Way Eng.*, W. M. Jones; *Chairman Try. Com.*, Ald. J. Jones; *Vice-Chairman*, Coun. A. S. Dutton.

Chesterfield Corporation Tramways, Chatsworth Road, Chesterfield. [T.A., Tramways, Chesterfield; T.N., 78.] *Gen. Manager*, H. Campion; *Assist. Gen. Manager*, W. A. Toppin; *Traffic Manager*, F. Root; *Chairman Try. Com.*, Ald. E. Shentall; *Vice-Chairman*, Coun. Cropper.

Colchester Corporation Tramways, Magdalen Street, Colchester. [T.A., Tramways, Colchester; T.N., 92.] *Gen. Manager and Engineer*, R. C. Bullough; *Chairman Try. Com.*, Coun. Everett; *Vice-Chairman*, Coun. Burleigh.

Colne Corporation Tramways, Colne, Lancashire. *General Manager and Engineer*, T. G. Richardson; *Chairman Try. Com.*, Coun. R. Knight.

Coventry Corporation Tramways, Priestley's Bridge, Coventry. [T.A., Tramways, Coventry; T.N., 1014.] *Engineer and General Manager*, T. R. Whitehead; *Assistant Engineer*, W. M. Milnes; *Chairman*, Coun. H. W. Wale; *Vice-Chairman*, Coun. J. Grant.

Croydon Corporation Tramways, Tramways Office, Thornton Heath, Surrey. [T.A., Tramways, Croydon; T.N., 406, Croydon.] *Tramways Manager*, T. B. Goodyer; *Chairman Try. Com.*, Coun. A. A. Thomson; *Vice-Chairman*, Ald. G. J. Allen, J.P.

Darlington Corporation Tramways, Haughton Road, Darlington. [T.A., Tramways, Darlington; T.N., 2435.] *General Manager and Elec. Eng.*, J. R. P. Lunn; *Traffic Supt.*, J. Fraser; *Chairman Try. Com.*, Ald. Sir C. Starmer.

Dartford Urban District Council Light Railways, Dartford. *Chairman Try. Com.*, Coun. R. Penney; *Vice-Chairman*, Coun. W. J. Bourne.
[Lines worked by Bexley U.D. Council, *q.v.*]

Darwen Corporation Tramways, Lorne Street, Darwen. [T.N., 104.] *Gen. Manager and Eng.*, G. A. Newsome; *Boro. Elec. Eng.*, F. M. Fletcher; *Chairman Try. Com.*, Coun. Geo. Pickup; *Vice-Chairman*, Coun. Butterworth.

Derby Corporation Tramways, 4, Victoria Street, Derby. [T.N., 410.] *Gen. Manager*, F. Harding; *Elec. Eng.*, T. P. Wilmshurst; *Per. Way Eng.*, J. Ward; *Chairman Try. Com.*, Coun. W. Eaton, J.P.

Doncaster Corporation Tramways, Grey Friar's Road, Doncaster. [T.A., Rayner, Doncaster, T.N., 43.] *Manager*, T. Potts; *Elec. Eng.*, S. R. Windle; *Chairman Try. Com.*, Coun. S. Balmforth; *Vice-Chairman*, Coun. T. Bramworth.

Dover Corporation Tramways, Town Hall, Dover. [T.A., Trams, Dover; T.N., 294.] *Gen. Manager*, E. H. Bond; *Per. Way Eng.*, W. C. Hawke (Boro. Surveyor); *Chairman Try. Com.*, Coun. Barwick; *Vice-Chairman*, Coun. Norman.

Dundee Corporation Tramways, Town House Buildings, Dundee. [T.N., 1340]; *Gen. Manager and Eng.*, Peter Fisher; *Elec. Eng.*, H. Richardson; *City Eng.*, J. Thomson; *Chairman Try. Com.*, Coun. A. Malcolm.

East Ham Corporation Tramways, Nelson Street, East Ham. [T.N., 611 and 100 East Ham.] *Gen. Manager and Elec. Eng.*, W. C. Ullmann; *Chairman Try. Com.*, Ald. H. Osborn, J.P.

Eccles Corporation Tramways, Eccles. *Elec. Eng.*, H. W. Angus; *Per. Way Eng.*, T. S. Picton; *Chairman Try. Com.*, Coun. Alexander; *Vice-Chairman*, Ald. Pearson. [Lines worked by Salford Corporation.]

Edinburgh Corporation Tramways, 2, St. James' Square, Edinburgh. *Gen. Manager*, R. S. Pilcher; *Traffic Supt.*, W. P. Young; *Burgh Engineer*, A. H. Campbell; *Chairman Try. Com.*, Coun. W. R. Sleigh.
[The entire system of the Edinburgh tramways is at present worked by cable traction, with the exception of 1¼ miles of electric lines. The Council has decided to electrify the whole of the system, and plans are now being made for the commencement of the work.]

Erith Urban District Council Tramways, Tramway Depôt, Walnut Tree Road, Erith. [T.A., Tramways, Erith; T.N., 36.] *Gen. Manager and Elec. Engineer*, J. C. Williams; *Chairman Try. Com.*, Coun. G. C. Humphreys.

Exeter Corporation Tramways, Heavitree Street, Exeter. *Gen. Manager*, R. O. Baldwin; *Elec. Eng.* H. D. Munro; *Per. Way Eng.*, T. Moulding; *Chairman Try. Com.*, Coun. F. G. Towill; *Vice-Chairman*, Coun. F. Chick.

Farnworth Urban District Council Tramways, Albert Road, Farnworth. *Chairman Try. Com.*, Coun. R. H. Cunliffe, J.P.; *Vice-Chairman*, Coun. Stanley.
[Lines leased to the South Lancashire Trys. Co.]

Glasgow Corporation Tramways, 46, Bath Street, Glasgow. [T.A., Trams, Glasgow; T.N., 1040, Douglas.] *Gen. Manager*, J. Dalrymple; *Deputy Gen. Manager*, L. Mackinnon; *Chief Eng.*, J. Ferguson; *Elec. Eng.*, ——— *Sec. and Treasurer*, J. N. Wilson; *Chairman Try. Com.*, Coun. Kelly; *Vice-Chairman*, Bailie M'Whirr.

Gloucester Corporation Light Railway, Bristol Road Depôt, Gloucester. [T.A., Tramways, Gloucester; T.N. 155.] *Gen. Manager and Elec. Eng.*, F. H. Corson; *Chairman Try. Com.*, Coun. J. O. Roberts (Mayor); *Vice-Chairman*, Coun. C. J. Ramstedt.

Great Yarmouth Corporation Tramways, Caister Road, Great Yarmouth. [T.N. 265.] *Gen. Manager*, F. L. Turner; *Elec. Eng.*, Gordon Bryant; *Per. Way Eng.*, J. W. Cockrill (Borough Surveyor); *Chairman Try. Com.*, Ald. J. T. C. Salmon; *Vice-Chairman*, Ald. D. McCowan.

Halifax Corporation Tramways, Skircoat Road, Halifax. [T.N., 36 and 382.] *Traffic Manager*, Jas. D. Caird; *Try. Eng.*, J. W. Galloway; *Per. Way Eng.*, J. Lord (Boro. Eng.); *Chairman Try. Com.*, Ald. A. Fawcett; *Vice-Chairman*, Coun. A Broadley.

Haslingden Corporation Tramways, John Street, Haslingden. *Gen. Manager, Elec. Eng., and Per. Way Eng.*, Barnes Kay; *Chairman Try. Com.*, Coun. Halstead; *Vice-Chairman*, Coun. Haworth.

Herne Bay Pier Tramway (owned and worked by Herne Bay U.D.C.), Herne Bay. [T.N., 22.] *Res. Manager*, P. W. Carey.

Heywood Corporation Tramways, Heywood, Lancs. [T.N., 47.] *Gen. Manager*, D. H. Davies; *Per. Way Eng.*, J. Bt Nuttall; *Chairman Try. Com.*, Ald. J. Ashworth, J.P.; *Vice-Chairman*, Ald. T. Popple, J.P.

Huddersfield Corporation Tramways, John William Street, Huddersfield. [T.N., 698 and 398.] *Gen. Manager and Eng.*, A. A. Blackburn; *Track Eng.*, K. F. Campbell (Borough Eng.); *Elec. Eng.*, J. W. Turner; *Traffic Supt.*, T. Hartley; *Chairman Try. Com.*, Coun. E. H. Sellers; *Vice-Chairman*, Coun. T. Canby.

Hull Corporation Tramways, Alfred Gelder Street, Hull. [T.N., 444, Corporation] *Manager*, E. S. Rayner; *Traffic Supt.*, C. F. Ellwood; *Engineer*, F. W. Bricknell (City Engineer) [T.N., 943, Corporation]; *Chairman Try. Com.*, Coun. D. Willoughby; *Vice-Chairman*, Coun. Richardson.

Ilford Urban District Council Tramways, Ley Street, Ilford. [T.N., 684.] *Manager and Engineer*, L. E. Harvey; *Chairman Try. Com.*, Coun. H. G. Odell; *Vice-Chairman*, Coun. H. L. Crofts.

Ipswich Corporation Tramways, Constantine Road, Ipswich. [T.A., Ayton, Tramways, Ipswich; T.N., 354.] *Gen. Manager and Elec. Eng.*, Frank Ayton; *Traffic Supt.*, A. Butler; *Rolling Stock Supt.*, W. A. Fairhead; *Chairman Try. Com.*, Coun. E. C. Ransome (Mayor); *Vice-Chairman*, Coun. W. P. Burton.

Kearsley Urban District Council Tramways, Council Office, Kearsley, Farnworth, S.O. *Clerk U. D. C.*, H. Martin.
[Lines leased to and worked by the South Lancashire Tramways Co.]

Keighley Corporation Tramways, Coney Lane, Keighley. [T.A., Tramways, Keighley; T.N., 13 & 263.] *Gen. Manager and Elec. Eng.*, H. Webber; *Chairman Try. Com.*, Coun. A. Smith.

Kilmarnock Corporation Tramways Electricity Works, Kilmarnock. [T.N., 95.] *Elec. Eng. and Manager*, W. C. Bexon. *Consulting Engineers*, Kennedy and Jenkin; *Convener Try. Com* Coun. R. Lorimer.

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ELECTRIC TRAMWAYS IN THE UNITED KINGDOM

Kirkcaldy Corporation Tramways, Electricity Works Victoria Road, Kirkcaldy. [T.A., Tramways, Kirkcaldy; T.N., 124, 174, and 175.] *Manager & Elec. Eng.*, O. F. Francis; *Traffic Manager*, Jas. Fisher; *Chairman Try. Com.*, Coun. G. Fergusson.

Lancaster Corporation Tramways, Electricity Works, Lancaster. [T.A., Milnes, Tramways, Lancaster; T.N., 1, L.] *Gen. Manager & Elec. Eng.*, G. C. Milnes; *Acting Boro. Electrical Engineer and Tramways Manager*, J. B. Patterson; *Traffic Manager*, W. T. Charlton; *Chairman Try. Com.*, Coun. T. Wilkinson.

Leeds City Tramways, Swinegate, Leeds. [T.A., Tramways, Leeds; T.N., 21601; *General Manager*, J. B. Hamilton; *Traffic Supt.*, A. Daggett; *Elec. Eng.*, John Burbridge; *Highways and Per. Way Eng.*, E. W. Cockerlyne; *Car Works Supt.*, G. E. Watmough; *Chairman Try. Com.*, Ald. R. A. Smithson; *Vice-Chairman*, Ald. H. Brown.

Leicester Corporation Tramways, 20 and 22, Humberstone Gate, Leicester. [T.N., 2177.] *Manager & Sec.*, A. F. Lucas; *Boro. & Try. Eng.*, E. G. Mawbey; *Boro. Elec. Eng.*, T. R. Smith; *Cons. Engs.*, Kincaid, Waller & Manville; *Chairman Try. Com.*, Ald. S. Flint, J.P.; *Vice-Chairman*, Ald. G. Banton, J.P.

Leith Corporation Tramways, 165, Leith Walk, Leith. [T.N., 415.] *Gen. Manager*, F. A. Fitzpayne; *Per. Way Eng.*, J. R. Findlay (*Burgh Eng.*); *Chairman Try. Com.*, Bailie Goalen.

Leyton District Council Tramways, Car Depot, Lea Bridge Road, Leyton, E. [T.A., Tramways, Leyton; T.N., 17 Walthamstow.] *Manager*, F. Schofield; *Elec. Eng.*, F. Harman Lewis; *Per. Way Eng.*, E. H. Essex; *Chairman Try. Com.*, Coun. T. P. Haines.

Lincoln Corporation Tramways, Brayford Side North, Lincoln. [T.A., Clegg 109 Lincoln; T.N., 109]. *General Manager and Elec. Eng.*, Stanley Clegg; *Chairman Try. Com.*, Ald. W. S. White.

Liverpool Corporation Tramways, 24, Hatton Garden, Liverpool. [T.A., Tramways, Liverpool; T.N., 6054 and 7701, Central.] *General Manager*, P. Priestly; *Per. Way Eng.*, J. A. Brodie (*City Engineer*); *Rolling Stock Supt.*, T. Ridyard; *Chairman Try. Com.*, F. C. Wilson; *Vice-Chairman*, Ald. F. Smith, J.P.

London County Council Tramways, 23, Belvedere Road, Lambeth, London, S.E.1. [T.A., Lotram, Watloo, London; T.N., 4335 Hop.] *General Manager*, A. L. C. Fell; *Traffic Manager*, J. K. Bruce; *Electrical Engineer*, P. L. Riviere; *Rolling Stock Eng.*, W. E. Ireland; *Per. Way Eng.*, J. Welling; *Chairman Highways Com.*, W. J. Squires; *Vice-Chairman*, Lieut.-Comm. A. Cooper Rawson.

Lowestoft Corporation Tramways, Norwich Road, Lowestoft. [T.N., 87.] *Gen. Manager*, H. H. Saunders; *Elec. Eng.*, W. R. May; *Chairman Try. Com.*, Coun. F. Spashett.

Maidstone Corporation Tramways, Tramway Offices, Tonbridge Road, Maidstone. [T.A., Lambert, Tramways, Maidstone; T.N., 448] *Gen. Manager and Elec. Eng.*, A. T. Lambert; *Chairman Try. Com.*, Ald. D. T. J. Lyle; *Vice-Chairman*, Coun. Armstrong.

Manchester Corporation Tramways, 55, Piccadilly, Manchester. [T.A., Tramways, Manchester; T.N., 7800 City.] *Gen. Manager*, J. M. McElroy; *Traffic Sup.*, J. T. Oakes; *Elec. Eng.*, J. J. McMahon; *Chief Civil Eng.*, H. Mattinson; *Rolling Stock Supt.*, G. R. Blackburn; *Chairman Try. Com.*, Ald. J. Bowes; *Vice-Chairman*, Ald. A. W. Chapman.

Middlesbrough Corporation Tramways Middlesbrough. *Gen. Manager*, H. G. Jeken; *Chairman, Try. Com.*, Coun E. Turner; *Vice-Chairman*, Ald. J. Calvert.

Middlesex County Council Light Railways, Middlesex Guildhall, Westminster, London, S.W. *County Eng.*, H. T. Wakelam, M.I.C.E.; *Chairman of Light Railways Com.*, County Ald. H. Burt; *Vice-Chairman*, County Ald. F. Goodyear.

Nelson Corporation Light Railways, Charles Street, Nelson. [T.N., 115.] *Manager and Elec. Eng.*, G. F. Navler; *Per. Way Eng.*, W. Shackleton; *Chairman Try. Com.*, Ald W. F. Cooke.

Newcastle-upon-Tyne Corporation Tramways, Manors, Newcastle. [T.A., Traction, Newcastle; T.N., 913 and 914 Central.] *Gen. Manager & Engineer*, Ernest Hatton; *Traffic Supt.*, T. Chalder; *Per. Way Eng.*, W. J. Steele; *Chairman Try. Com.*, Coun. R. Mayne; *Vice-Chairman*, Coun. A. M. Sutherland.

Newport (Mon.) Corporation Tramways, Town Hall, Newport, Mon. [T.A., Dynamo, Newport, Mon.; T.N., 3111 and 2932, Nat.] *Gen. Manager*, N. J. Young; *Boro. Elec. and Tramways Eng.*, A. Nichols Moore; *Chairman Try. Com.*, Coun. J. Moxon; *Vice-Chairman*, Ald. F. Phillips.

Northampton Corporation Tramways, St. James', Northampton. [T.N., 279 & 280.] *Gen. Manager and Elec. Eng.*, J. F. Cameron; *Chairman Try. Com.*, Coun. T. D. Lewis; *Vice-Chairman*, Coun. W. Beale.

Nottingham Corporation Tramways, Beastmarket Hill, Nottingham. [Tramways, Nottingham; T.N., 225.] *General Manager & Elec. Eng.*, John Aldworth; *Traffic Supt.*, H. Morley; *Per. Way Eng.*, Arthur Brown (*City Eng.*); *Rolling Stock Supt.*, W. Boot; *Chairman Try. Com.*, Coun. J. Morris (Mayor), J.P.; *Vice-Chairman*, J. Clarkson.

Oldham Corporation Tramways, Wallshaw Depot, Oldham. [T.A., Tramways, Oldham; T.N., 1495.] *Gen. Manager & Eng.*, Wm. Chamberlain; *Traffic Supt.*, M. Mullin; *Chairman Try. Com.*, Coun. Cheetham; *Vice-Chairman*, Ald. Stanbury.

Perth Corporation Tramways, 128, High Street, Perth. [T.N., 226 & 101.] *Tramways Manager*, W. G. Snell; *Elec. & Tramways Eng.*, John Lambert; *Per. Way Eng.*, R. McKillop (*Burgh Surv.*); *Chairman Try. Com.*, Coun. Fisher.

Plymouth Corporation Tramways, Drake Circus, Plymouth. [T.N. 518, Plymouth.] *Gen. Manager*, H. P. Stokes; *Elec. Eng.*, E. J. Okell; *Chairman Try. Com.*, Coun. J. H. Pillar; *Vice-Chairman*, Coun. J. Moon.

Pontypridd Urban District Tramways, Generating Station, Treforest, Pontypridd. [T.N. 33.] *Gen. Manager and Elec. Eng.*, J. E. Teasdel; *Traffic Supt.*, A. Armstrong; *Per. Way Eng.*, W. E. Lowe (*Surveyor*); *Chairman Try. Com.*, Coun. M. L. Jones.

Portsmouth Corporation Tramways, Town Hall, Portsmouth. [T.N., 4910 Corporation.] *Gen. Manager*, W. R. Spaven; *Elec. Eng., and Rolling Stock Supt.*, V. G. Lironi; *Traffic Supt.*, W. Munford; *Chairman Try. Com.*, Coun, J. Timpson, J.P. (Mayor); *Vice-Chairman*, Ald. R. Payne.

Preston Corporation Tramways, Holmrook Road, Preston. [T.A., Corporation Tramways, Preston; T.N., 273.] *Gen. Manager and Elec. Eng.*, J. F. Simpson; *Assistant Manager and Engineer*, H. Clayton; *Chairman, Try. Com.*, Coun. T. Parkinson; *Vice-Chairman*, Ald. J. Ormrod.

Radcliffe Urban District Council Tramways, Council Offices, Radcliffe, Lancs. *Res. Eng.*, H. Wilkinson; *Per. Way Eng.*, W. L. Rothwell; *Clerk*, S. Mills; *Chairman Try. Com.*, Coun. Lund.

[These tramways are worked as part of the Bury system.]

Rawtenstall Corporation Tramways, Bacup Road, Rawtenstall. [T.N., 81.] *Gen. Manager and Elec. Eng.*, C. L. E. Stewart; *Chairman Try. Com.*, Coun. H. Crabtree.

Reading Corporation Tramways, Mill Lane, Reading. [T.A., Tramways Manager, Reading; T.N., 330.] *Gen. Manager & Elec. Eng.* J. M. Calder; *Chairman Try. Com.*, Ald. C. G. Field, J.P.

Rochdale Corporation Tramways, Mellor Street, Rochdale. [T.A., Tramways, Rochdale; T.N., 48.] *Gen. Manager & Eng.*, G. Webster; *Traffic Manager*, R. Bentley; *Per. Way Eng.*, H. Yarwood; *Rolling Stock Supt.*, E. Sidgwick; *Chairman Try. Com.*, Ald. Taylor.

Rotherham Corporation Tramways, St. George's Hall, Rotherham. [T.A., Tramways, Rotherham; T.N., 152 and 241.] *General Manager*, T. R. Sykes; *Per. Way Eng.*, T. P. Collinge; *Traffic Supt.*, W. G. Marks; *Chairman Try. Com.*, Ald. G. Gummer, J.P.; *Vice-Chairman*, Coun. G. E. Caine, J.P.

St. Helens Corporation Tramways, Town Hall, St. Helens, Lancs. *Manager*, L. C. Bellamy; *Chairman Try. Com.*, Coun. A. Rudd; *Vice-Chairman*, Coun. T. Abbott.

Salford Corporation Tramways, 32, Blackfriars Street, Salford. [T.A., Tramways, Salford; T.N., 5367 and 5368 Central.] *Gen. Manager*, Geo. W. Holford; *Elec. Eng.*, J. A. Robertson; *Traffic Supt.*, J. W. Blakemore; *Per. Way Supt.*, E. B. Martin; *Rolling Stock Supt.*, R. Chadwick; *Chairman Try. Com.*, Ald. H. Linsley, J.P.; *Vice-Chairman*, Ald. W. H. Barrett.

Sheffield Corporation Tramways, 8, Division Street, Sheffield. [T.A., Tramways, Sheffield; T.N., 4600.] *General Manager*, A. R. Fearnley; *Assist. Man.*, H. Watson; *Per. Way Eng.*, W. J. Hadfield; *Rolling Stock Supt.*, J. Smith; *Chairman Try. and Motors Com.*, Ald. Sir W. E. Clegg, J.P.; *Vice-Chairman*, Ald. W. C. Fenton, J.P.

Shipley Urban District Tramway, Dockfield, Shipley. [T.A., Electricity Works, Shipley; T.N., 190.] *Elec. Eng.*, Wm Redman; *Chairman Try. Com.*, Coun. F. F. Rhodes; *Vice-Chairman*, Coun. H. Bradley.

[Lines leased to Bradford Corporation.]

Southampton Corporation Tramways, 161, Above Bar, Southampton. [T.A., Tramways, Southampton; T.N., 301.] *Gen. Manager*, J. Dobson; *Boro. Elec. Engineer*, H. S. Ellis; *Traffic Manager*, J. Brierley; *Chairman Try. Com.*, Ald. F. A. Dunsford, J.P.

Southend-on-Sea Corporation Tramways, London Road, Southend-on-Sea. [T.N., 96.] *Gen. Manager and Elec. Eng.*, R. Birkett; *Traffic Manager*, J. T. Fayle; *Per. Way Eng.*, R. H. Dyer (*Acting Boro. Surveyor*); *Rolling Stock Supt.*, J. Dobson; *Chairman Try. Com.*, Coun. G. Radford.

Southend Pier Electric Railway, (owned and worked by Southend-on-Sea Corporation). [T.A., Piermaster, Southend; T.N., 91.] Southend-on-Sea. *Elec. Eng.*, C. R. Norton; *Acting Piermaster*, J. C. Herbert; *Chairman*, Coun. F. Britain.

Southport Corporation Tramway, 44, Chapel Street, Southport. [T.N., 116.] *Gen. Manager*, T. J. Kendrew; *Boro' Elec. Eng.*, A. S. Black; *Chairman Try. Com.*, Coun. Clayton; *Vice-Chairman*, Coun. Richardson.

South Shields Corporation Tramways, Dean Road, South Shields. [T.A., Tramways, South Shields; T.N., 157.] *Gen. Manager & Elec. Eng.*, J. C. Whiteley; *Boro. Elec. Eng.*, Edgar Maxon; *Chairman Try. Com.*, Ald. W. G. Wylie; *Vice-Chairman*, Coun. J. G. Winskell.

Stalybridge Hyde, Mossley, and Dukinfield Tramways and Electricity Board, Waterloo Road, Stalybridge. [T.N., 311.] *Commercial Manager*, F. Schofield; *Chief Eng.*, R. Blackmore; *Chairman Try. Com.*, Ald. H. Sykes; *Vice-Chairman*, Coun. S. C. Homer.

Stockport Corporation Tramways, Mersey Square, Stockport. [T.N., 232 and 237.] *Manager*, A. T. Eardley; *Elec. Eng.*, R. Lomax; *Chairman Try. Com.*, Coun. T. W. Potts, O.B.E.; *Vice-Chairman*, Coun. C. Littler.

Sunderland Corporation Tramways, Tramway Offices, Monkwearmouth, Sunderland. [T.A., Trys. Manager, Sunderland; T.N., 948.] *Gen. Manager and Elec. Eng.*, A. R. Dayson; *Per. Way Eng.*, T. Inglis Rudman; *Chairman Try. Com.*, Ald. G. New, J.P.; *Vice-Chairman*, Coun. W. Walker, J.P.

Swindon Corporation Tramways, Electricity Works, Swindon. [T.A., Tramways, Swindon; T.N., 4.] *General Manager*, T. Medcalf; *Elec. and Mech. Eng.*, F. Newey; *Chairman Try. Com.*, Ald. Stevens; *Vice-Chairman*, Coun. Horder.

Tees-side Railless Traction Board, South Bank, Yorkshire. [T.A. Railless Board, South Bank; T.N., 31, South Bank]. *General Manager and Engineer*, M. Turner; *Chairman*, Councillor W. G. Grace.

Wallasey Corporation Tramways, Seaview Road, Wallasey. [T.A., Tramways, Liscard; T.N., 1431, Liscard.] *General Manager*, R. R. Greene; *Elec. Eng.*, J. H Crowther; *Per. Way Eng.*, W. H. Travers; *Chairman Try. Com.*, Coun. F. E. Howse; *Vice-Chairman*, Coun. H. W. Griffin.

Walsall Corporation Tramway, St. Paul's Buildings, The Bridge, Walsall. [T.A., Tramways, Walsall; T.N., 238 & 559.] *Gen. Manager*, ———; *Elec. Eng.*, H. A. Howie; *Per. Way Eng.*, J. Taylor (*Boro. Surveyor*); *Chairman, Try. Com.*, Ald. J. Cope *Vice-Chairman*, Ald. J. Williams.

Walthamstow Urban District Council Tramways, Chingford Road, Walthamstow, [T.A., Tramways, Walthamstow; T.N., 20.] *Tramways Manager*, W. Murray; *Elec. Eng.*, G. R. Spurr (Priory Avenue, Walthamstow); *Per. Way Eng.*, G. W. Holmes; *Chairman Trys. Com.*, Coun. J. W. West.

Warrington Corporation Tramways, Mersey Street, Warrington. [T.N., 196] *Gen. Manager*, J. Telfer; *Elec. Eng.*, F. V. L. Mathias; *Chairman Try. Com.*, Coun. Dr. G. W. Joseph; *Vice-Chairman*, Ald. J. Wilkinson.

West Bromwich Corporation Tramway, Electricity Works, West Bromwich. [T.N., 100.] *Boro. Eng.*, A. D. Greatorex; *Boro. Elec. Eng.*, W. A. Jackson; *Chairman Highways Com.*, Ald. A. G. Turley, J.P.; *Vice-Chairman*, Ald. G. Garratt.

[These tramways are leased to the South Staffs. (Lessee) Co., Ltd.]

West Ham Corporation Tramways, Greengate Street, Plaistow, London, E. [T.A., Trameurs, Plais., London; T.N., 862 and 868 East.] *General Manager*, L. Slattery; *Boro' Elec. Eng.*, F. W. Purse; *Chairman Try. Com.*, Coun. G. Croot.

West Hartlepool Corporation Tramways, Cleveland Road, West Hartlepool. [T.N., 6073.] *Gen. Manager & Eng.*, Chas. Burgess; *Chairman Try. Com.*, Ald. Martin; *Vice-Chairman*, Coun. Turnbull.

Wigan Corporation Tramways, Market Place, Wigan; [T.N., 226.] *General Manager and Eng.*, B. Hall; *Traffic Supt.*, R. Hoggard; *Per. Way Eng.*, R. B. Donald; *Chairman Try. Com.*, Coun. A. Guest; *Vice-Chairman*, Coun. J. Walkden.

Wolverhampton Corporation Tramways, Municipal Tramway Offices, Cleveland Road, Wolverhampton. [T.N., 324.] *Gen. Manager and Engineer*, C. O. Silvers; *Boro. Elec. Eng.*, S. T. Allen; *Per. Way Eng.*, George Green; *Chairman Try. Com.*, Ald. Sir C. T. Mander, Bart., J.P.; *Vice-Chairman*, Ald. S. Craddock, J.P.

Yarmouth Corporation Tramways (See Great Yarmouth Corporation Tramways).

York Corporation Tramways, 8, Clifford Street, York. [T.N., 302]. *Gen. Manager and Elec. Eng.*, J. W. Hame; *Traffic Supt.*, J. W. Horton; *Per. Way Eng.*, F. W. Spurr (City Surveyor); *Chairman Try. Com.*, Ald. S. W. Meyer; *Vice-Chairman*, Coun. W. H. Sessions.

COMPANY TRAMWAYS

Aberdeen Suburban Tramways Company, 15, Golden Square, Aberdeen. [T.A., Judicial, Aberdeen; T.N., 2583.] *Manager & Per. Way Eng.*, A. Wilkie; *Sec.*, G. Duncan; *Chairman*, James Mearns; *Directors*, Dr. W. Christie, Jas. Sellar.

Airdrie and Coatbridge Tramways Company, Tramway Depôt, Main Street, Coatbridge [T.N., 105], and Electrical Federation Offices, Kingsway, London, W.C. *Gen. Manager*, A. Robertson; *Sec.*, P. N. Gray; *Chairman*, W. L. Madgen; *Directors*, H. S. Day, A. C. Miles, G. J. Somerville.

Barnsley and District Electric Traction Company, Ltd., Car Depot, Sheffield Road, Barnsley. [T.A., Tramways, Barnsley; T.N., 159.] *General Manager*, W. E. Nicoll; *Acting Sec.*, P. N. Gray; *Chairman*, E. Garcke; *Directors*, Col. Sir Thomas Pilkington, Bart., E. A. Paris.

Barrow-in-Furness Tramways, Salthouse Road Depot, Barrow.

[These Tramways have been purchased, and are now worked by Barrow-in-Furness Corporation.]

Bath Electric Tramways Company, Ltd., Walcot Street, Bath, and 119-125, Finsbury Pavement, London, E.C. [T.A., Trams, Bath; T.N., 1214.] *Gen. Manager and Eng.*, W. E. Hardy; *Traffic Supt.*, E. Seckington; *Sec.*, H. J. Almond; *Chairman*, J. B. Hamilton; *Directors*, H. F. Clutterbuck, E. H. R. Trenow, A. A. C. Swinton.

Bessbrook and Newry Tramway Company Bessbrook, Co. Armagh. [T.A., Tramways, Bessbrook.] *Manager*, M. Hamilton; *Eng.*, H. Dowell *Chairman*, J. N. Richardson; *Directors*, C. H. Richardson, R. T. Scott, T. W. Richardson, J. McGreggor Greer.

Birmingham District Power and Traction Company, Power Station, Downing Street, Smethwick, and Electrical Federation Offices, Kingsway, London, W.C. [T.A., Power Station, Smethwick; T.N., 65 Smethwick.] *Gen. Manager*, W. G. Bond; *Secretary*, B. Kingsford; *Chairman*, C. Shirreff Hilton; *Directors*, J. A. Lycett, W. L. Madgen, S. R. Blundstone, R. J. Howley.

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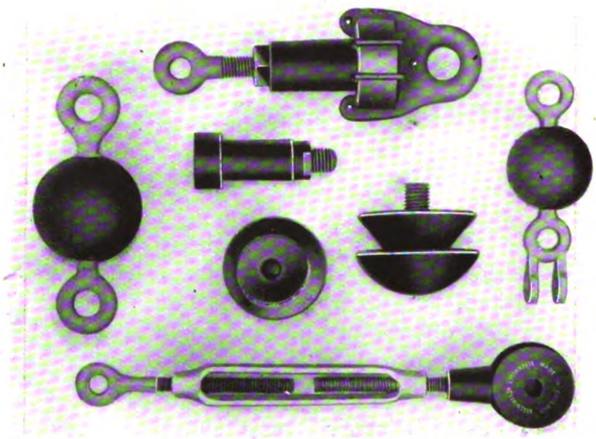

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ELECTRIC TRAMWAYS IN THE UNITED KINGDOM

Blackpool and Fleetwood Tramroad.
[This Tramway is now owned and worked by Blackpool Corporation.]

Blackpool and Fylde Light Railway Company, 6, Clifton Street, Blackpool. (No appointment of engineer or officials yet made.) *Secretary*, R. Bibby; *Chairman*, John Greenwood; *Directors*, T. Fisher, J.P., John Platt, J.P., W. Hardman, J.P., R. H. Mabbott.

Blackpool, St. Anne's, and Lytham Tramways Company, Ltd., Squires Gate, and 30, Birley Street, Blackpool. [T.N., 327 and 22]. *Gen. Manager and Elec. Eng.*, H. W. Laing; *Traffic Manager*, G. W. Wood; *Rolling Stock Supt.*, J. Partington; *Secretary*, Chas. E. Riding; *Chairman*, G. Nicholson; *Directors*, T. M. Smith, T. Preston.

Brighton Beach Electric Railway, Madeira Road, Brighton. [T.A., Volk, Brighton; T.N., 14 P.O.] *Manager and Eng.*, Magnus Volk; *Traffic Superintendent*, Miss Barton; *Per. Way Eng.*, J. Barker; *Secretary*, A. Volk; *Chairman*, Magnus Volk; *Directors*, M. H. Volk, B. W. Symonds, A. Volk.

Bristol Tramways and Carriage Company, Ltd., Clare Street House, Bristol. [T.A., Cab, Bristol; T.N., 74 & 3074 Nat.] *Manager*, Colonel S. E. Smith; *Assist. Manager*, W. H. Stradling; *Electrical Engineer*, W. Nairn; *Permanent Way Engineer*, G. T. C. Edwards; *Secretary*, H. F. Cooper; *Chairman*, S. White, J.P.; *Directors*, W. G. Verdon Smith (*Managing*), J. H. Howell, J.P., Sir G. Stanley White, Bart., S. E. Baker, Chas. Challenger.

British Electric Traction Company, Ltd., Electrical Federation Offices, Kingsway, London, W.C. E. Garcke (*chairman*); *Directors*, C. Shirreff Hilton, W. L. Madgen, Sir Charles Ollivant, A. Shepherd, C. G. Tegetmeier, P. D. Tuckett, J. S. Austen; *Manager*, C. H. Dade; *Secretary*, T. Bower; *Accountant*, C. Walmsley.

This company is interested in the following tramways, particulars of which are given under their respective names:

Airdrie & Coatbridge.
Barnsley & District.
Barrow-in-Furness.
Birmingham & District Power & Traction Co.:
Birmingham & Midland
Dudley, Stourbridge, & District.
South Staffordshire.
Wolverhampton Dist.
Devonport & District.
Gateshead & District.
General Elec. Tramways.
Gravesend & Northfleet.
Greenock & Port Glasgow.
Jarrow & District.
Kidderminster & District.
Merthyr.
Middleton.
Oldham, Ashton, & Hyde.
Peterborough.
Potteries.
Rothesay.
Sheerness & District.
Swansea.
Taunton.
Tynemouth & District.
Weston-super-Mare & District.
Worcester.
Wrexham & District.
Yorkshire (Woollen Dist.)

Burton and Ashby Light Railway, Power Station, Swadlincote, nr. Burton-on-Trent. [T.A., Toulmin, Swadlincote; T.N., 1.] *Manager and Eng.*, Jas. Toulmin; *Secretary*, W. N. Bancroft; *Chairman*, G. Murray Smith.
[The line is owned and worked by the Midland Railway Company.]

Camborne and Redruth Tramways, Elec. Works, Carn Brea, R.S.O., Cornwall. [T.N., 3, Camborne.] (Owned by Urban Elec. Supply Co.) *Manager and Eng.*, L. A. Hards; *Sec.*, C. H. Jones; *Chairman*, P. D. Tuckett; *Directors*, E. Charrington, H. B. Grotian, Sir Douglas Owen.

Carlisle Tramways Company, Ltd., City of, Depot and Offices, London Road, Carlisle. [T.A., Tramways, Carlisle; T.N., 0180.] *Engineer and Manager*, E. W. Sleight.

Chatham and District Light Railways Company, Luton Road, Chatham, and 88, Cannon Street London, E.C. [T.A., Tramways, Chatham; T.N., 51.] *General Manager*, W. Jensen; *Assist. Manager*, A. J. Bousfield; *Secretary*, A. Clements; *Chairman*, A. R. Monks; *Directors*, H. C. Levis, J. F. Nauheim, W. B. H. Martindale.

Cheltenham and District Light Railway Company, Cheltenham. [T.N., 341.] *Chairman*, A. R. Holland; *Directors*, A. H. Beatty, W. Shearer, H. L. Williams, A. S. Guinness, H. J. McCormick; *Sec.*, Wm. C. Bryden, C.A., 66, Queen Street, London, E.C.; *Local Eng. and Manager*, Henry J. McCormick, Dalkeith, Gloucester Road, Cheltenham.

Clontarf and Hill of Howth Tramroad Company, 39, Dame Street, Dublin. [T.A., c/o Railways, Dublin; T.N., 917.] *Secretary*, J. P. Chapman; *Chairman*, W. L. Murphy; *Directors*, E. Anderson, J. J. Dudley.

Cork Electric Tramways and Lighting Company, Ltd., Albert Street, Cork. [T.A., Tramways, Cork; T.N., 78 and 535.] *Manager and Engineer*, H. H. Nalder; *Traffic Manager*, H. G. Whiting; *Per. Way Engineer*, H. Mack; *Secretary*, A. Clements; *Chairman*, A. R. Monks; *Directors*, E. Anderson, Capt. W. Martindale, H. C. Levis.

Dartford Urban District Council Light Railways. Car Depot. Priory Road, Dartford. [T.N., 31 Dartford.] (Leased to and worked by Bexley Urban District Council, Broadway, Bexleyheath, Kent).

Devonport and District Tramways Company, Electrical Federation Offices, Kingsway, London, W.C. *Secretary*, S. M. Wright; *Acting Sec.*, P. N. Gray; *Chairman*, C. S. B. Hilton; *Directors*, J. S. Raworth, E. R. Soames, C. G. Tegetmeier, R. J. Sutcliffe.
[This Company's undertaking has been sold to Plymouth Corporation.]

Dewsbury, Batley, and Birstall Tramways Company, Ltd., Electrical Federation Offices, Kingsway, London, W.C.
[Lines worked by Yorkshire (Woollen District) Electric Tramways, Ltd., *q.v.*]

Dewsbury and Ossett Corporation and Soothill Nether Urban District Council Tramways, (Lessees: The National Elec. Construction Co., Ltd., 62 and 63, Queen Street, London, E.C.) [T.A., Overhauled, London; T.N., 6616 and 6617 City.] *Manager*, W. McGibbon.

Douglas—Ramsey. (The Manx Elec. Rly. Company), 1, Strathallan Crescent, Douglas. (See Manx Electric Railway Company).

Douglas Southern Electric Tramways, Ltd., Marine Drive, Douglas, Isle of Man, and 24, Brazennose Street, Manchester. [T.A., Traffic, Douglas.] *Manager and Eng.*, R. Orton; *Sec.*, J. E. Sharples; *Chairman*, T. J. Hutchinson; *Directors*, I. E. Winslow, E. A. Hopkins.

Dublin and Lucan Electric Railway Company, 15, Conyngham Road, Dublin. [T.A., Lucan Tramway, Dublin; T.N. 2282, 4005 and 4006 Dublin, and 5 Lucan.] *Manager, Elec. Eng., and Sec.*, D. McDowall Grosart, J.P.; *Chairman*, J. W. Hill, J.P.; *Directors*, E. Anderson, J.P., A. B. Coyle, J.P., G. V. Murphy, J. R. Dillon.

Dublin United Tramways Company (1896), Ltd., 9, Upper Sackville Street, Dublin. [T.A., Tramways, Dublin; T.N., 58 and 59.] *Gen. Manager*, G. Marshall Harriss; *Elec. Eng.*, R. Tanham; *Con. Eng.*, H. F. Parshall; *Per. Way Eng.*, P. F. O'Sullivan; *Secretary*, W. McHugh; *Chairman*, Rt. Hon. L. A. Waldron, P.C.; *Directors*, Joseph Mooney, J.P., William Hewat, Capt. Wm. L. Murphy.

Dudley, Stourbridge and District Electric Traction Company, Ltd. (Section of The Birmingham and Midland Tramways Joint Committee), Power Station, Downing Street, Smethwick, Brierley Hill, Staffs., and Electrical Federation Offices, Kingsway, London, W.C. [T.N., 65 Smethwick.] *General Manager*, W. G. Bond; *Secretary*, E. H. Woodhall; *Chairman*, S. R. Blundstone; *Directors*, J. A. Lycett, R. J. Howley, B. Kingsford (*Acting Sec.*)

Dumbarton Burgh and County Tramways Company, Tramway Depot, Dumbarton, and 28, Rutland Street, Edinburgh. [T.A., Tramways, Dumbarton; T.N., 119.] *Gen. Manager and Elec. Eng.*, J. P. McMahon; *Secretary*, A. Dishart; *Chairman*, G. Balfour; *Directors*, K. Sanderson, K. A. Scott Moncrieff.

Dundee, Broughty Ferry & District Tramways Company, Milton, Monifieth, N.B. [T.N., 24 Monifieth.] *Gen. Manager and Engineer*, George Brander; *Secretary*, E. Cowan; *Chairman*, George Balfour; *Directors*, Edward Cowan, David Hynd.

Dunfermline and District Tramways Company, Tramway Depot, Cowdenbeath, Fife, and 8, New Row, Dunfermline. *Manager and Engineer*, J. H. Shepherd; *Secretary*, G. A. Nicolson; *Cons. Engs.*, Hawtayne & Zeden; *Directors*, Wm. Low, G. Balfour (*managing*), K. Sanderson, D. Hynd.

Falkirk & District Tramways Company, Larbert Road, Larbert, Stirlingshire. [T.A., Tramways Co., Falkirk; T.N., 154 Falkirk.] *Gen. Manager and Engineer*, D. Hays; *Chairman*, G. M. Brown; *Directors*, A. W. Tait, R. Hunter, G. Balfour, C. D. Geddes.

Felixstowe Pier Railway, Felixstowe. (The Coast Development Corporation, Ltd.) *Elec. Eng.*, E. A. Lambert.

Gateshead and District Tramways Company, Tramway Depôt, Sunderland Road, Gateshead, and Electrical Federation Offices, Kingsway, London, W.C. [T.A., Tramway Depôt, Gateshead; T.N., 125 & 408 Gateshead.] *General Manager*, William Morrison; *Secretary*, H. W. Davis; *Chairman*, H. S. Day; *Directors*, H. A. Stagg, C. R. Greene, J.P., Judge L. A. Atherley-Jones, K.C.

Giant's Causeway and Portrush Electric Tramway Company, Portrush. *Manager & Sec.*, W. McCurdy; *Elec. Eng.*, W. A. Traill; *Chairman*, J. S. Moore; *Directors*, A. B. Stuart, W. A. Traill.

Glossop Tramways, Electricity Works, Glossop (owned by the Urban Electric Supply Co.) [T.N., 34, Glossop.] *Manager and Res. Eng.*, C. E. Knowles; *Rolling Stock Supt.*, T. L. Podmore; *Secretary*, C. H. Jones; *Chairman*, P. D. Tuckett; *Directors*, E. Charrington, F. E. Gripper, H. B. Grotrian, D. Owen.

Gosport and Fareham Tramways, Tramways and Lighting Office, Gosport, Hants., and Moorgate Station Chambers, London, E.C. [T.A., Tramways, Gosport; T.N., 3, Post Office, Gosport.] *Eng. and Manager*, J. Fereday Glenn; *Sec.*, J. Barber Glenn; *Chairman*, A. Beattie, J.P., D.L.; *Directors*, J. Barber Glenn (*managing*), S. Hern.

Gravesend & Northfleet Electric Tramways, Ltd., Tramway Depot, Northfleet, Kent, and Electrical Federation Offices, Kingsway, London, W.C. [T.N., 958, Gravesend.] *Manager*, R. R. Blake; *Sec.*, H. C. Walter; *Acting Sec.*, J. S. Bowker; *Chairman*, E. Garcke; *Directors*, W. L. Madgen, P.N. Gray, W. S. Wreathall.

Great Crosby Tramways, 31, James Street, Liverpool.
[This tramway is worked by the Liverpool Overhead Railway Company.]

Great Grimsby Street Tramway Co., Southampton House, Cleethorpes, and Moorgate Station Chambers, London, E.C. [T.A., Blanco, Cleethorpes; T.N., 16.] *Manager and Eng.*, H. L. White; *Elec. Eng.*, H. O. White; *Managing Director and Secretary*, J. B. Glenn; *Chairman*, A. Beattie, J.P., D.L.; *Director*, S. Hern.

Greenock and Port Glasgow Tramways Company, Ladyburn, Greenock, and Electrical Federation Offices, Kingsway, London, W.C. [T.A., Tramways, Greenock; T.N., 562]. *Manager*, A. Robertson; *Secretary*, P. N. Gray; *Chairman*, W. L. Madgen; *Directors*, G. J. Somerville, A. C. Miles, H. S. Day.

Guernsey Railway Company, Ltd., Hougue-à-la-Perre, Guernsey. *Manager and Elec. Eng.*, Arthur G. Bird; *Sec.*, J. de Mouilpied; *Chairman*, G. F. Peek; *Directors*, W. D. Murdoch, J. B. Collings, Q. Le Pelley, T. W. Palmer.

Hampshire Light Railway (Electric) Company, Ltd., Moorgate Station Chambers, London, E.C. *Secretary*, J. B. Glenn; *Chairman*, A. Beattie, J.P.; *Directors*, J. Barber Glenn (*managing*), S. Hern.
[This company works the Portsdown and Horndean Light Railway.]

Hastings Tramways Company, Ltd., Beaufort Road, Silverhill, St. Leonards-on-Sea, and 1, Queen Victoria Street, London, E.C. [T.A., Tramways, Hastings, and Enshrine, London; T.N., 90 Hastings, and 3465, City]. *General Manager and Elec. Eng.*, W. Vincent Edwards; *Secretary*, W. R. Elston; *Chairman*, G. Kitchen; *Directors*, J. C. Williamson, Dr. Moody.

Imperial Tramways Company, Ltd., Clare Street House, Bristol. *Secretary*, F. H. Withers; *Manager*, F. Freshwater; *Chairman*, S. White, J.P.; *Directors*, W. G. Verdon Smith (*Managing*), J. H. Howell, Sir G. Stanley White, Bart.

Isle of Thanet Electric Tramways and Lighting Company, Ltd., St. Peter's, Kent, and Moorgate Station Chambers, London, E.C. [T.A., Tramways, St. Peters, Kent; T.N., 29 Broadstairs]. *Gen. Manager and Elec. Eng.*, J. A. Forde; *Traffic Supt.*, A. L. Gardener; *Secretary*, J. Barber Glenn; *Chairman*, A. R. Monks; *Directors*, Lord Arthur Butler, H. Brown.

Jarrow and District Electric Traction Company, Ltd., Electrical Federation Offices, Kingsway, London, W.C. [T.A., Jarrow, c/o Tramway, London; T.N., 2686 Holborn.] *Traffic Manager*, G. McClelland; *Secretary*, C. W. Francis; *Acting Sec.* H. A. Stagg; *Chairman*, G. J. Somerville; *Directors*, W. Morrison (*managing*), H. S. Day.

Kidderminster & District Electric Lighting and Traction Co., Ltd., Kidderminster, and Electrical Federation Offices, Kingsway, London, W.C. [T.N., 108]. *General Manager*, W. G. Bond; *Secretary*, B. Kingsford; *Chairman*, E. Garcke; *Directors*, J. A. Lycett, H. S. Day, W. L. Madgen.

Kinver Tramway, Kinver, and Electrical Federation Offices, Kingsway, London, W.C., *q.v.*, Dudley, Stourbridge, and District Elec. Traction Co., Ltd.

Lanarkshire Tramways Company, Edinburgh Road, Motherwell, N.B., and 88, Cannon Street, London, E.C. [T.A., Tramways, Motherwell; T.N., 64.] *Gen. Manager and Eng.*, G. F. Moller; *Elec. Eng.*, E. H. Glennie; *Per. Way Eng.*, R. Foster; *Traffic Supt.*, J. L. White; *Sec.*, A. Clements; *Chairman*, A. R. Monks; *Directors*, Lord Carmichael, Sir B. Cunard, Bart., H. C. Levis, J. F. Nauheim.

Lancashire United Tramways Limited, Atherton, Lancs. [T.A., Tramways, Atherton; T.N., 36, Atherton.] *Gen. Manager and Engineer*, E. H. Edwardes; *Secretary*, H. P. Conibear, F.C.I.S; *Chairman*, Hon. Sir A. Stanley, G.B.E.; *Directors*, J. M. Henderson, J.P., R. Watson, J.P., A. Adam, J. S. Austen.

Liverpool and Prescot Light Railway.—This line, which with the St. Helens Corporation Tramways forms the connecting link between the City of Liverpool and South Lancashire Tramways, is owned and worked by the Liverpool Corporation.

Liverpool Overhead Railway Company, 31, James Street, Liverpool. [T.A., Motor, Liverpool; T.N., 5463 Central.] *Gen. Manager and Eng.*, E. J. Neachell; *Secretary*, H. G. Alexander; *Chairman*, H. C. Woodward; *Directors*, J. E. Anderson, G. D. Killey, J. U. Hodgson, M. H. Maxwell.

Llandudno and Colwyn Bay Electric Railway, Limited, Tramway Depôt, Rhôs-on-Sea, Colwyn Bay, and Basildon House, Moorgate Street, London, E.C. *Gen. Manager*, Alex. G. Balfour; *Secretary*, A. W. R. Lovering; *Directors*, G. Balfour, A. W. Tait, T. Stoker.

Llanelly and District Electric Lighting and Traction Company, Ltd., Llanelly, and 66, Queen Street, London, E.C. *Engineer and Manager*, J. E. Stewart; *Secretary*, W. C. Bryden; *Chairman*, A. R. Holland; *Directors*, A. V. Anderson, M. A. Edwards, A. H. Beatty.

London and Suburban Traction Company, Ltd., Electric Railway House, Broadway, Westminster, London, S.W. *Secretary*, A. L. Barber; *Chairman*, Lord Stuart of Wortley; *Directors*, C. G. Tegetmeier, W. M. Acworth, W. C. Burton, E. Garcke, E. R. Soames, J. Devonshire (*managing*).

London United Tramways Ltd., Electric Railway House, Broadway, Westminster, London, S.W. [T.N., 6800, Victoria.] *Managing Director*, J. Devonshire; *Secretary*, A. L. Barber; *Gen. Manager*, C. J. Spencer; *Engineer*, A. V. Mason; *Traffic Supt.*, J. B. Mackinnon; *Chairman*, W. M. Acworth; *Directors*, Rt. Hon. Viscount Knutsford, F. V. Schuster, W. C. Burton, H. A. Vernet.

Luton Corporation Tramways (leased to and worked by Balfour, Beatty & Co., Ltd., 66, Queen Street, London, E.C.), Tramway Offices, Park Street, Luton. [T.N., 230.] *Engineer and Manager*, William W. Clark.

Mansfield & District Light Railway Co., Sutton Road, Mansfield, and 66, Queen Street, London, E.C. [T.A., Cars, Mansfield; T.N., 107.] *Eng. and Manager*, J. F. Dixon; *Secretary*, W. C. Bryden; *Chairman*, A. R. Holland; *Directors*, W. J. Chadburn, A. H. Beatty, G. Balfour, C. R. Walker.

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ELECTRIC TRAMWAYS IN THE UNITED KINGDOM

Manx Electric Railway Company, Ltd., 1, Strathallan Crescent, Douglas, Isle of Man, and 3, Finch Lane, London, E.C. [T.A., Electric, Douglas, Man.; T.N., 61.] *Gen. Manager & Eng.*, F. Edmondson; *Secretary*, J. Featherston; *Chairman*, Sir W. H. Vaudrey; *Directors*, B. E. Greenwell, E. Remnant, C. A. Huni.

Merthyr Electric Traction and Lighting Company, Ltd., 53, Pontmorlais Circus, Merthyr, and Electrical Federation Offices, Kingsway, London, W.C. [T.A., Tramway Company, Merthyr; T.N., 0180, Merthyr Tydfil.] *Managing Eng.*, L. W. Dixon; *Secretary*, H. A. Stagg; *Chairman*, G. J. Somerville; *Directors*, C. G. Tegetmeier, W. L. Madgen, E. R. Soames.

Metropolitan Electric Tramways, Limited, Electric Railway House, Broadway, Westminster, London, S.W. [T.A., Metrolito, Loudon; T.N., 6800, Victoria.] Manor House Offices, Seven Sisters Road, N. [T.A., Lentiscus, London; T.N., 77 Tottenham.] *Gen. Manager*, C. J. Spencer; *Engineer*, A. V. Mason; *Traffic Supt.*, J. B. Mackinnon; *Secretary*, A. L. Barber; *Chairman*, E. Garcke; *Directors*, W. L. Madgen, C. G. Tegetmeier, J. Devonshire (*Managing Director*).

Mexborough and Swinton Tramways Company, Electricity Works, Rawmarsh, Yorks. [T.N., 266], and 62 and 63, Queen Street, London, E.C. *Manager and Eng.*, W. McGibbon; *Consulting Elec. Eng.*, F. E. Stanley; *Assistant Engineer*, A. A. Davis; *Traffic Supt.*, M. McLeod; *Secretary*, L. D. H. Jacobs; *Chairman*, L. B. Schlesinger; *Director (Managing)*, W. B. Cownie, C.A.

Middlesbro, Stockton, and Thornaby Electric Tramway, Bridge Road, Stockton-on-Tees, and Clare Street House, Bristol. [T.A., Tramways, Stockton; T.N., 129.] *Manager*, F. Freshwater; *Secretary*, F. H. Withers; *Chairman*, Samuel White, J.P.; *Directors*, James H. Howell, J.P., Sir G. Stanley White, Bart., W. G. Verdon Smith (*Managing Director*).

Middleton Electric Traction Company, Ltd., Hiltonfold Lane, Middleton, and Electrical Federation Offices, Kingsway, London, W.C. [T.A., Tramway Depot, Middleton: T.N., 37 Middleton.] *Gen. Manager*, W. F. Endean; *Secretary*, G. R. Oliphant; *Acting Secretary*, J. S. Bowker; *Chairman*, Lord Vaux of Harrowden; *Directors*, J. V. Kitchener, C. H. Dade.

Musselburgh and District Electric Light and Traction Co., Ltd., High St., Musselburgh, N.B. [T.A., Tramways, Musselburgh; T.N., 115.] (Registered Office, 62 and 63, Queen Street, London, E.C. [T.N., 6616 and 6617, City.]; *Manager*, H. C. Babb; *Assistant Engineer*, H. Payn; *Traffic Supt.*, T. Smalley; *Secretary*, L. D. H. Jacobs; *Chairman*, L. B. Schlesinger; *Directors*, B. Burnham, J. Anderson, W. B. Cownie.

New General Traction Company, Ltd., 8, Crosby Square, London, E.C. *Secretary*, J. G. Mills; *Chairman*, Baron Emile B. d'Erlanger; *Directors*, F. Fitzgerald, C. Pakeman, R. J. West E. A. Hopkins (*managing*).
(This company controls the Norwich and the Douglas Southern Electric Tramways Companies.)

New St. Helens and District Tramways Company, Ltd., Atherton, Lancs. [T.A., Tramways, Atherton; T.N., 36 Atherton.] *Engineer and Manager*, C. D. Stanley; *Secretary*, H. P. Conibear; *Chairman*, Hon. Sir Arthur Stanley, G.B.E., M.P.; *Directors*, J. Hunter, J.P., H. Martin, J.P., J. M. Henderson, M.P., J. S. Austen, and E. H. Edwardes (*Managing*).

North Shields Tramway Company owned and worked by Tynemouth and District Elec. Trac. Co. *q.v.*

Norwich Electric Tramway Company, 5, Orford Hill, Norwich, and 8, Crosby Square, London, E C. [T.A., Tramways, Norwich; T.N., 475.] *Acting Manager and Engineer*, F. M. Foster; *Sec.*, J. G. Mills; *Directors*, E. A. Hopkins, F. FitzGerald, G. M. Chamberlin, C. Pakeman, R. J. West, and C. Tomlinson.

Nottinghamshire and Derbyshire Tramways Company, Tramway Depot, Langley Mill, Derbyshire, and 66, Queen Street, London, E.C. [T.A., Tramways, Langley Mill; T.N., 53, Langley Mill.] *Manager*, W. V. Morland; *Secretary*, Wm. C. Bryden; *Directors*, A. R. Holland, A. H. Beatty, C. R. Walker, and M. A. Edwards.

Oldham, Ashton and Hyde Electric Tramway, Ltd., Tramway Depot, Denton, Lancs., and Electrical Federation Offices, Kingsway, London, W.C. [T.A., Tramways, Denton: T.N., 265 Ashton.] *Supt.*, ——— *Acting Secretary*, J. S. Bowker; *Chairman*, E. Garcke; *Directors*, Judge L. A. Atherley Jones, K.C., J. E. Spagnoletti, W. S. Wreathall, J. V. Kitchener (*Managing Director.*)

Paisley District Tramways Company, Tramway Depôt, Paisley, and 83, Cannon Street, London, E.C. [T.N., 2938 Paisley.] *Gen. Manager and Elec. Eng.*, Fred Coutts; *Traffic Supt.*, E. Jeffs; *Secretary*, A. Clements; *Con. Eng.*, H. F. Parshall; *Chairman*, O. H. Smith; *Directors*, Lord Arthur Butler, D. Johnston Smith, John Young.

Peterborough Electric Traction Company, Ltd., Lincoln Road, Peterborough, and Electrical Federation Offices, Kingsway, London, W.C. [T.A., Tramways, Peterborough; T.N., 224.] *Gen. Manager*, A. Anderson; *Secretary*, S. M. Wright; *Acting Sec.*, P. N. Gray; *Chairman*, R. J. Howley; *Directors*, E. A. Paris, Lord Vaux of Harrowden.

Plymouth, Stonehouse and Devonport Tramways Co., 16, Edgcumbe Street, Stonehouse, Devon, and Moorgate Station Chambers, London, E.C. [T.N. 58.] *Manager*, ——— *Elec. Eng.*, J. Graham Pearce; *Sec.*, J. Barber Glenn; *Chairman*, Andrew Beattie, J.P., D.L.; *Directors*, S. Hern. J. B. Glenn (*Managing*).

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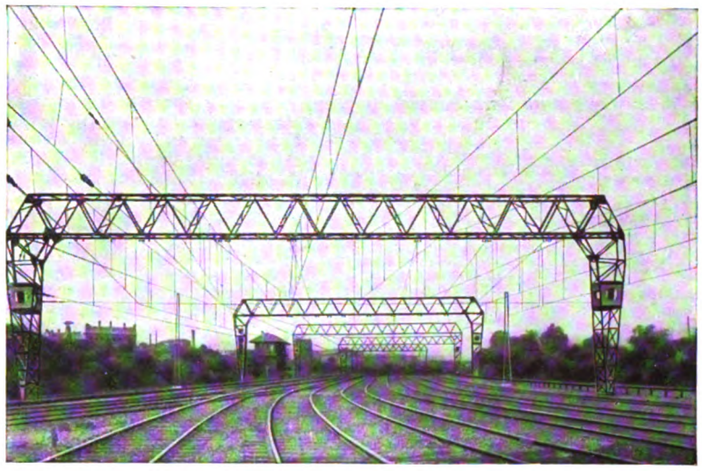

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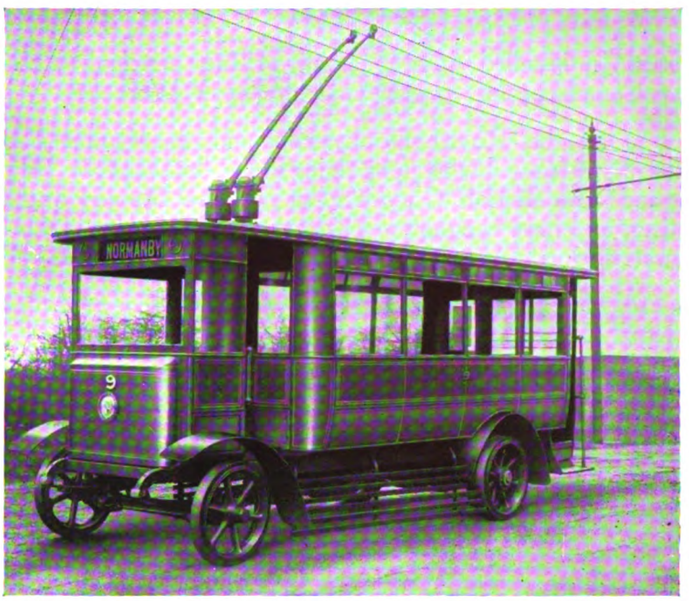

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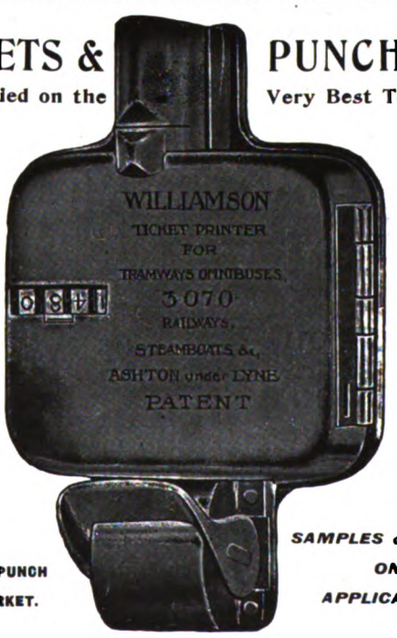

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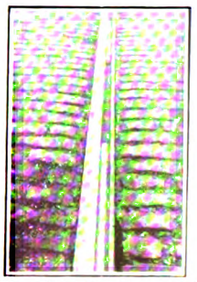
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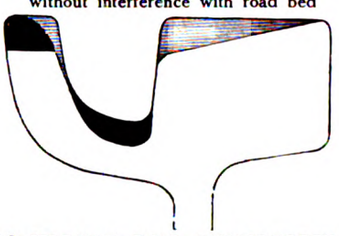

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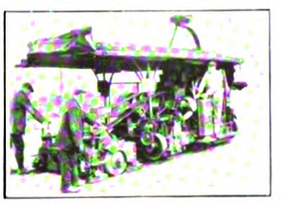
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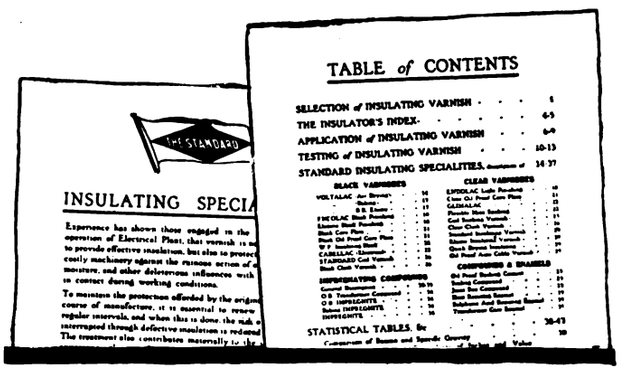

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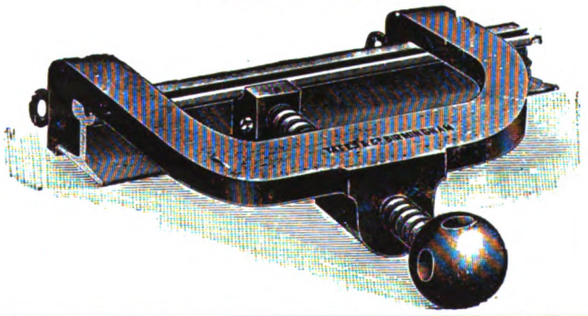

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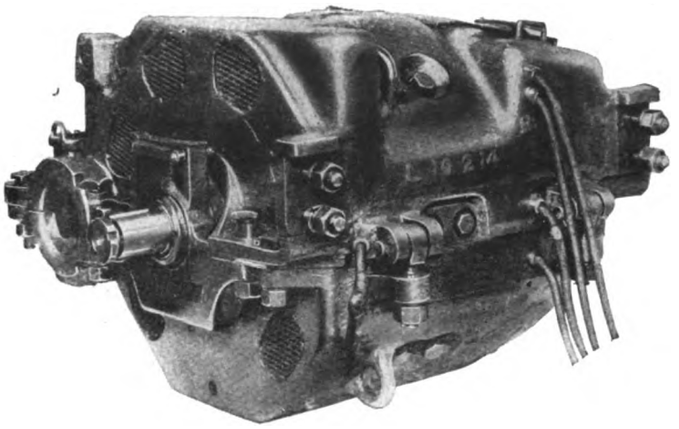

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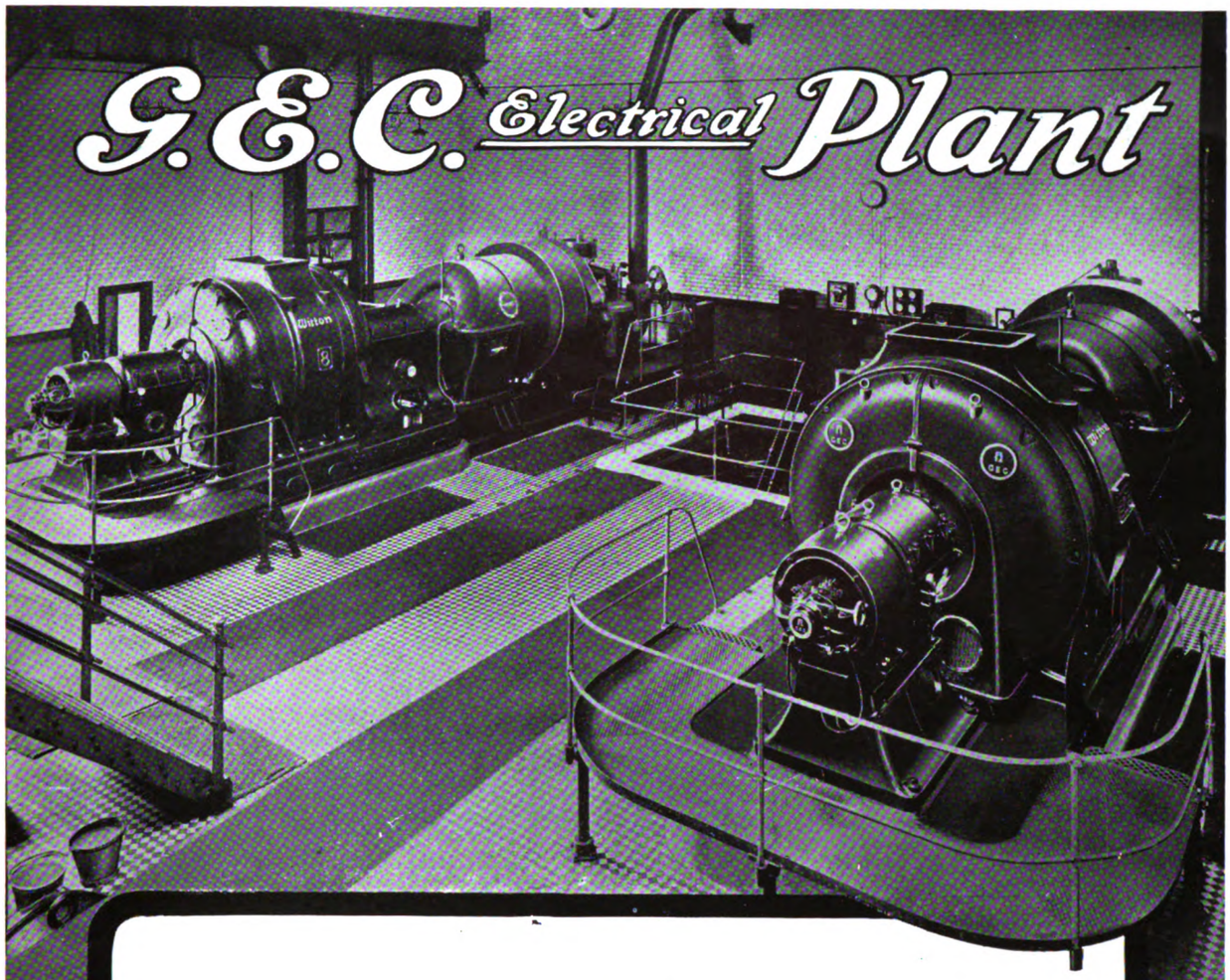

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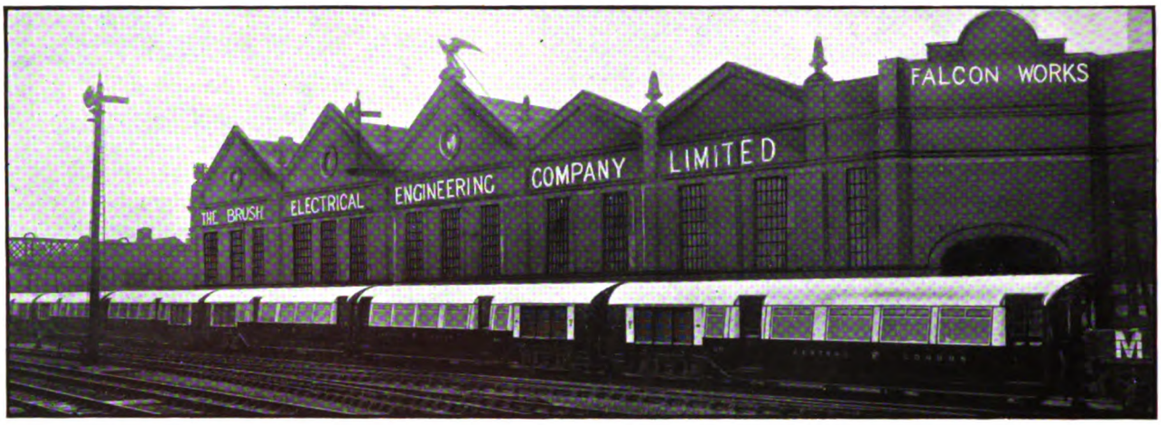

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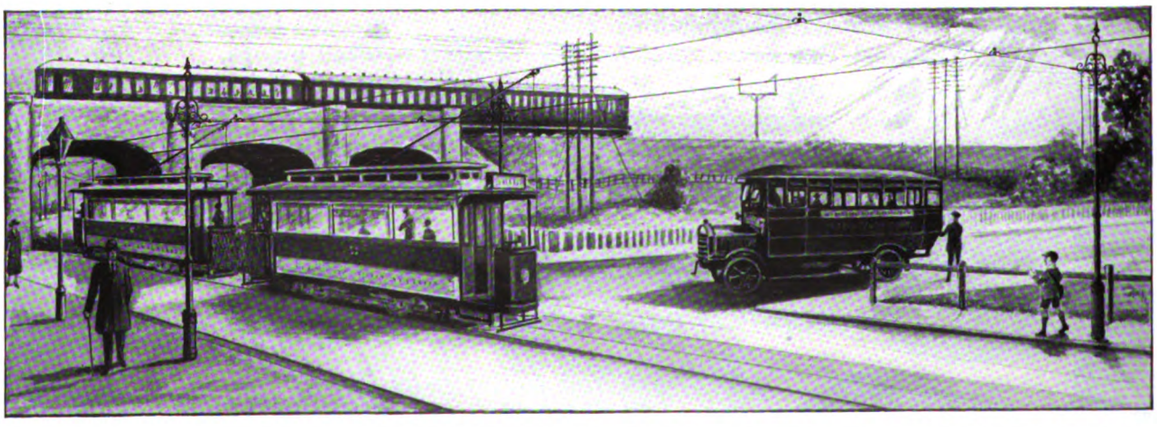

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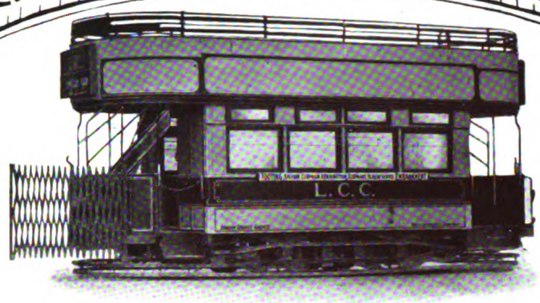

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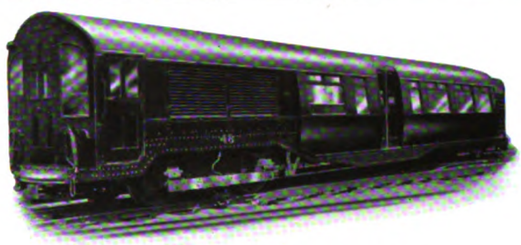

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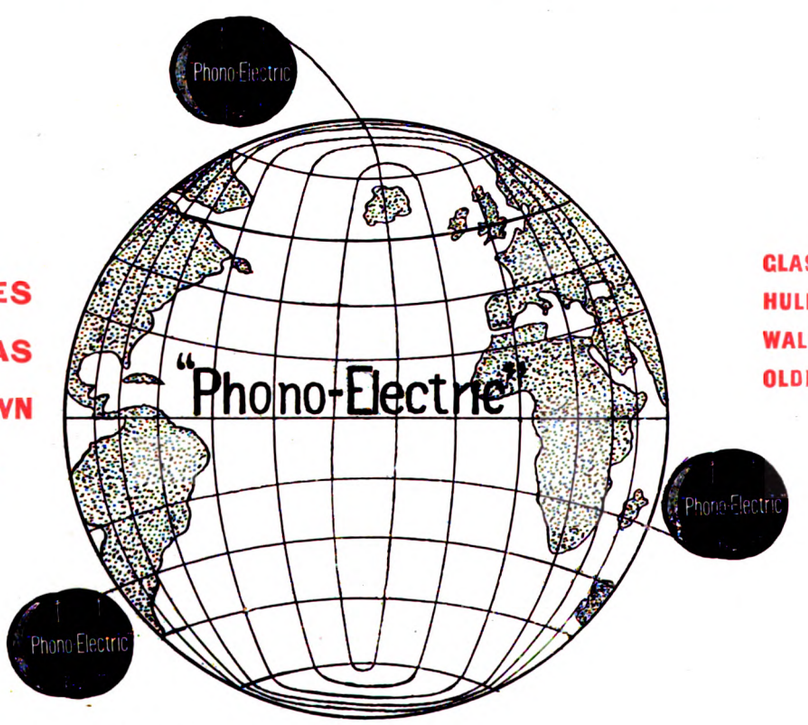

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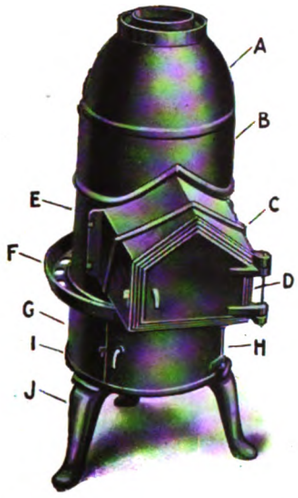

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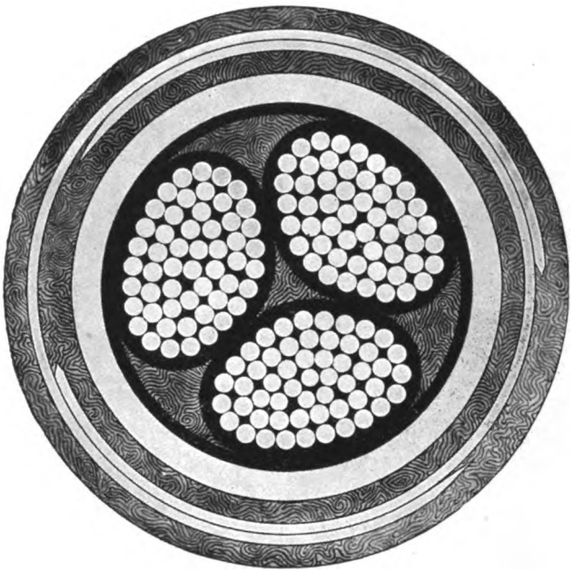

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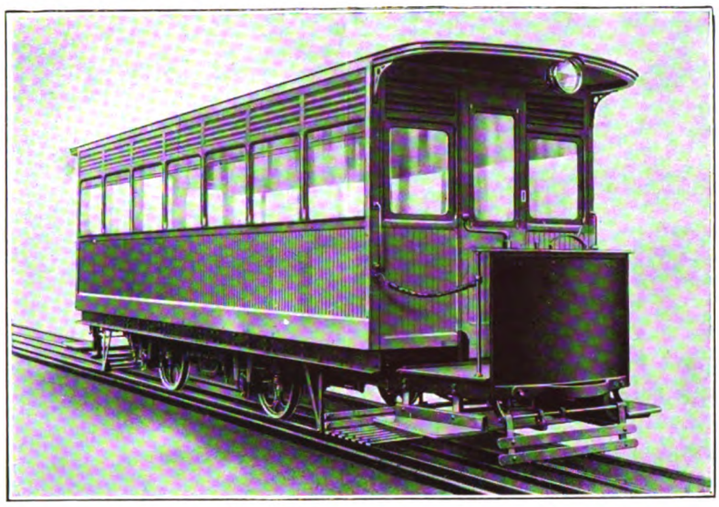

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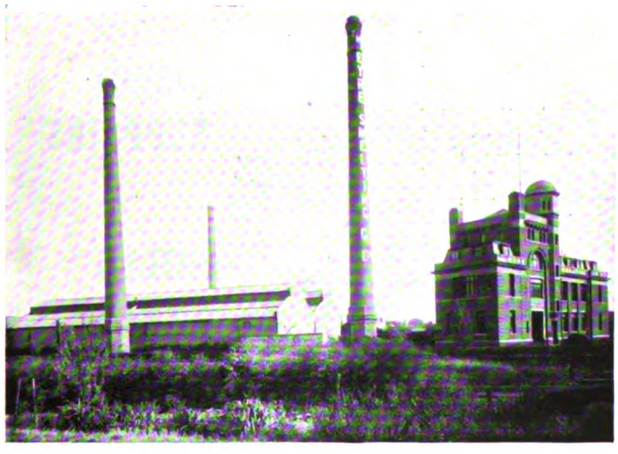

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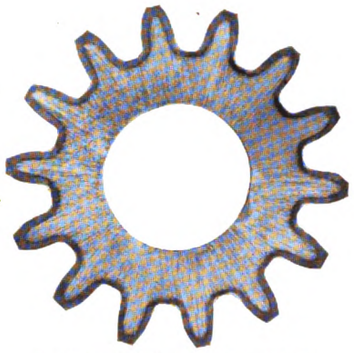

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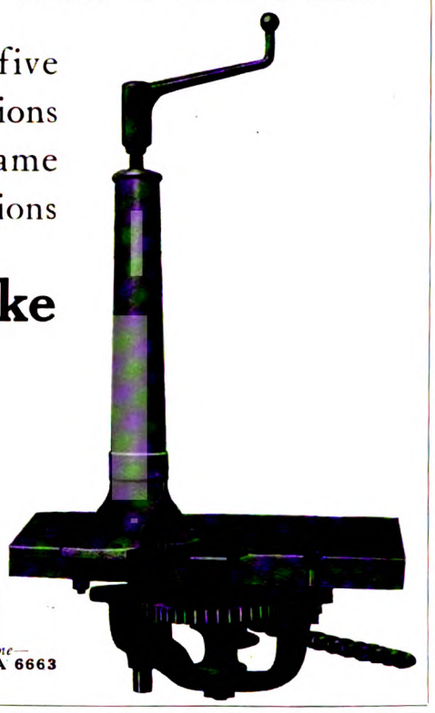

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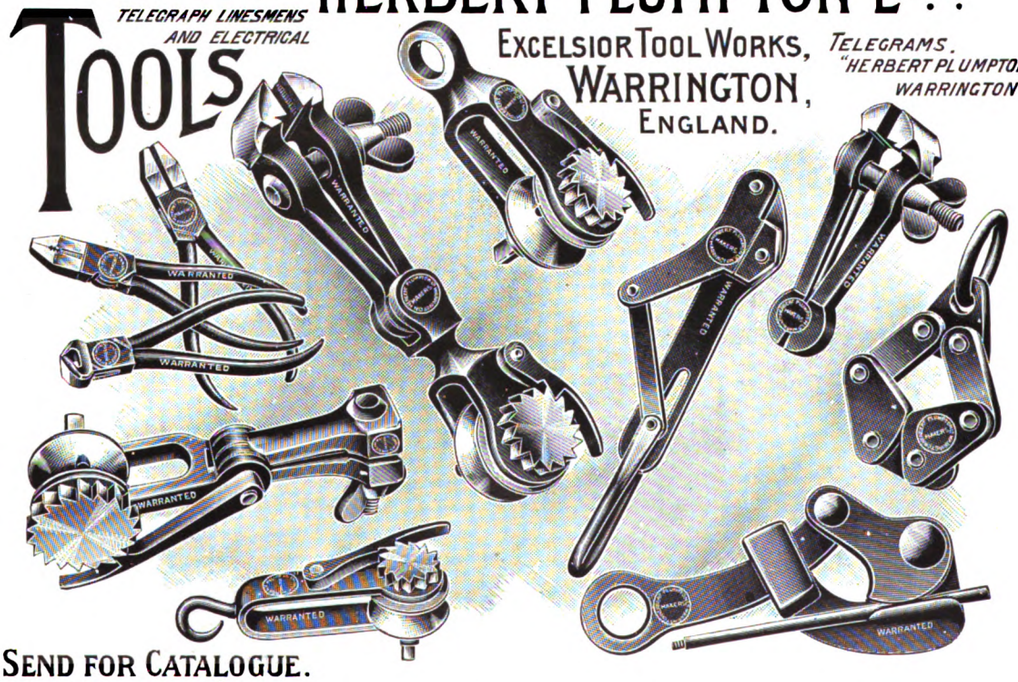

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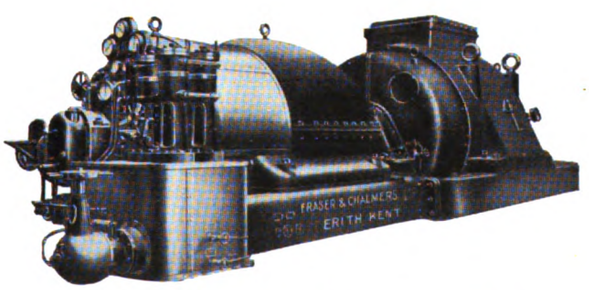

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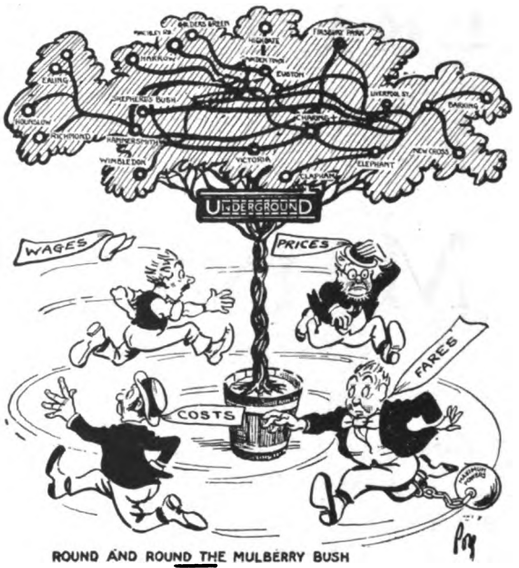

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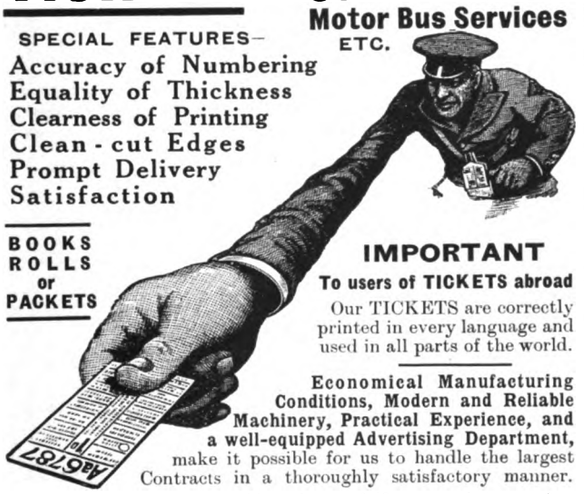

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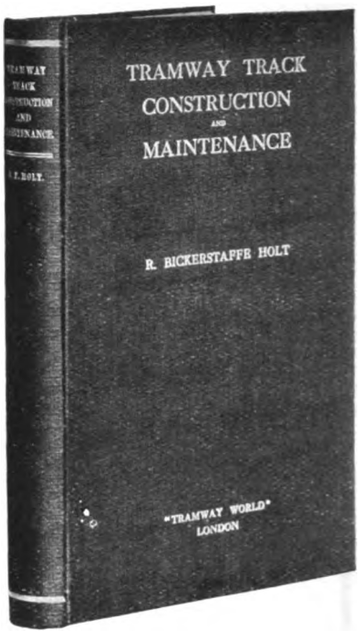

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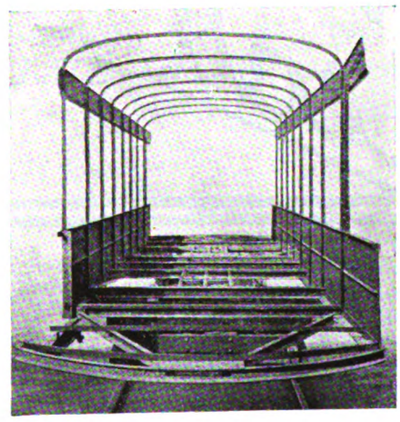

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The difference in tonnage weight is that much less in shocks and blows to the car, wheels, truck, axles, and track, multiplied at every sunk-joint along the route. Maintenance factors like these are modern problems and vital to your undertaking.

Because your own figures can prove that the cumbersome top-decker is a sheer loss in off-peak traffic, so can we prove by authentic figures that the little steel car is not only reducing operating costs, but positively *creating* more revenue.

Just one example out of scores. A town of 25,000 population operates 21 Birney Cars; service has increased 24%, due to greater mileage of the cars; earnings increased 38% or £9,400 annually; power consumption decreased 46%; annual net increase is £15,000. The little car by quicker headway and lower costs will increase revenue sufficient to pay *higher wages and reduce fares if need be.*

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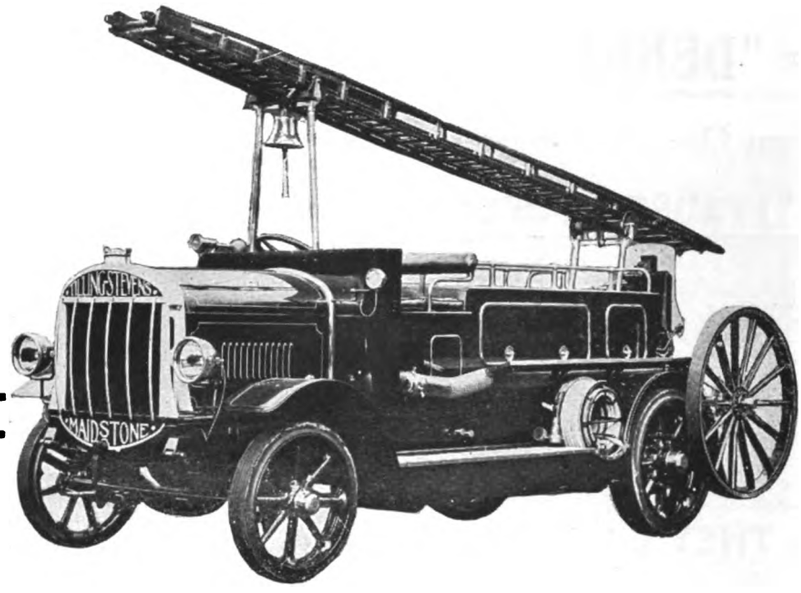

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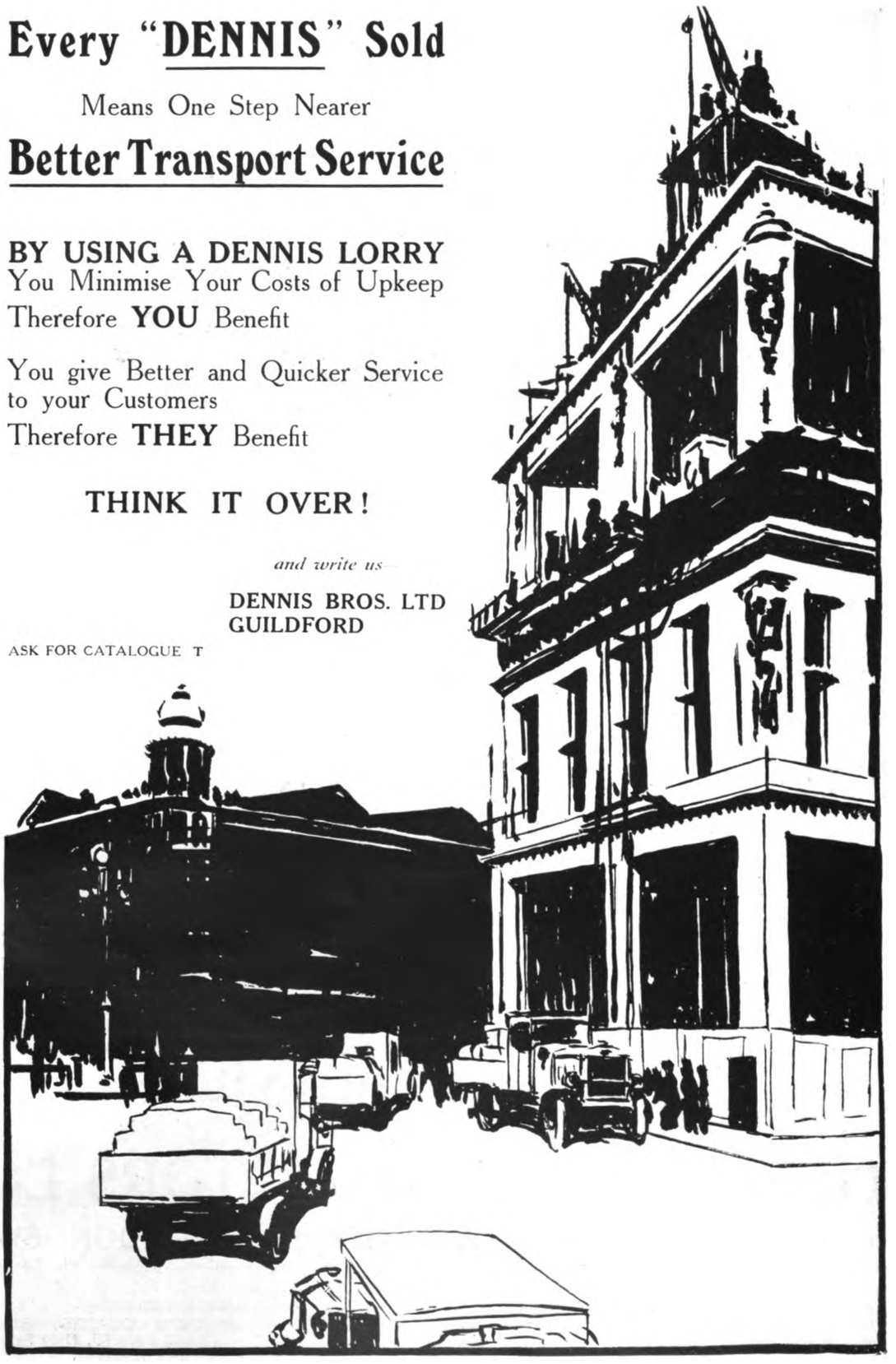

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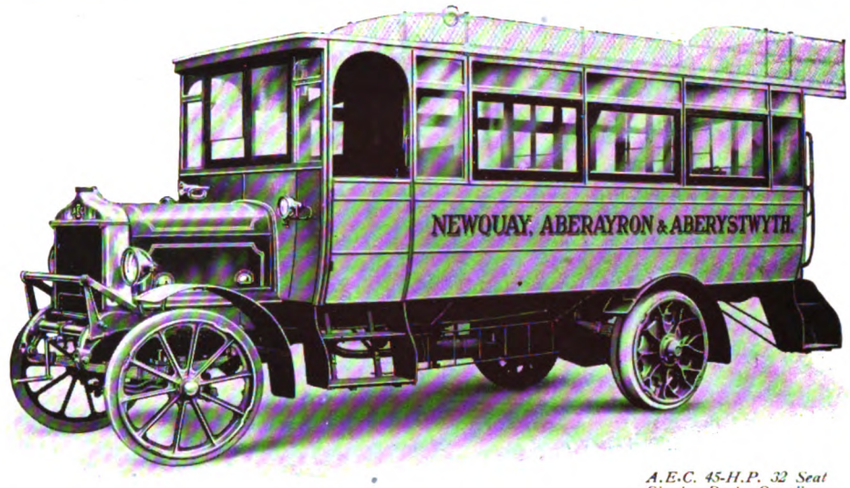

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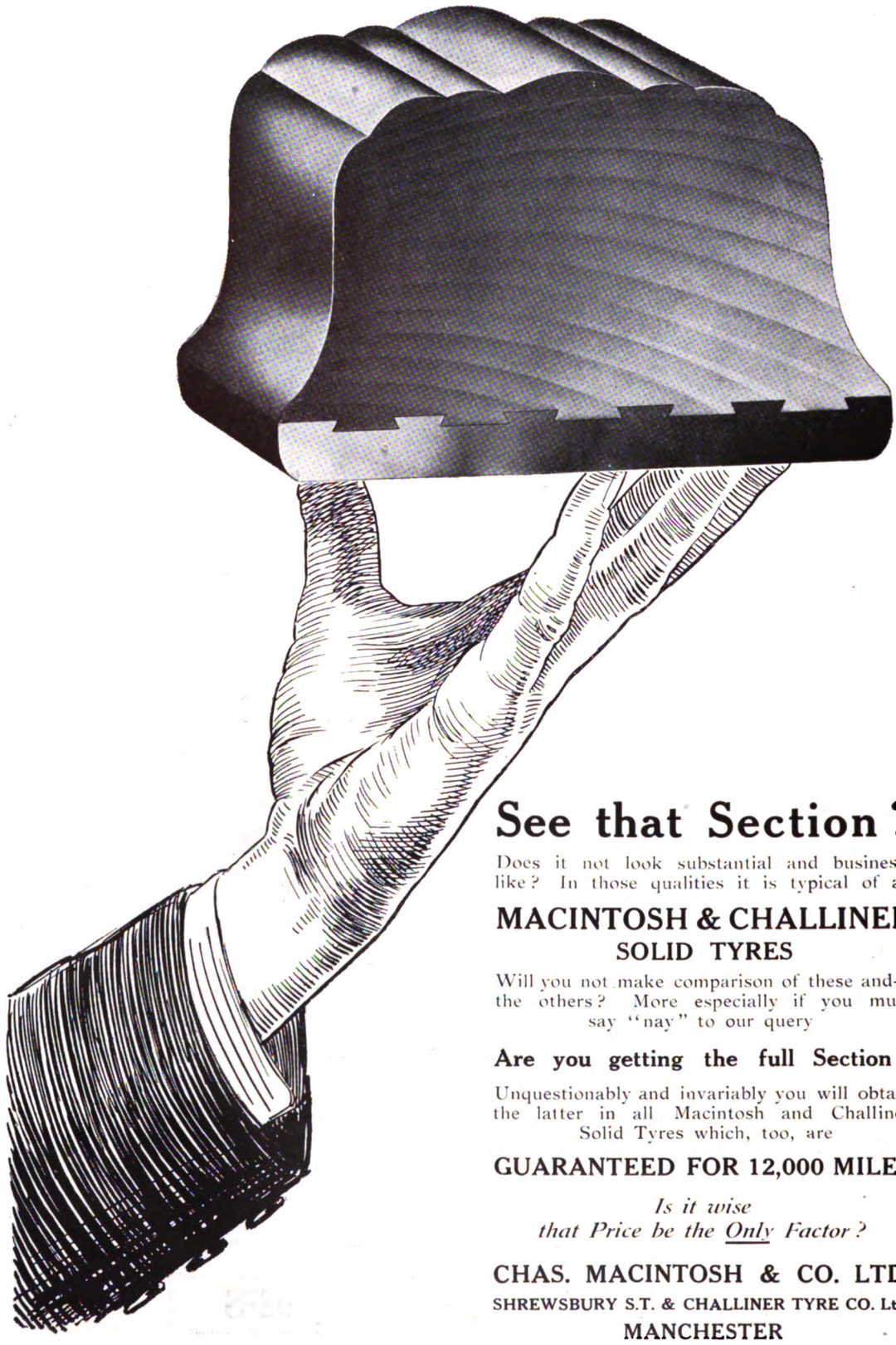

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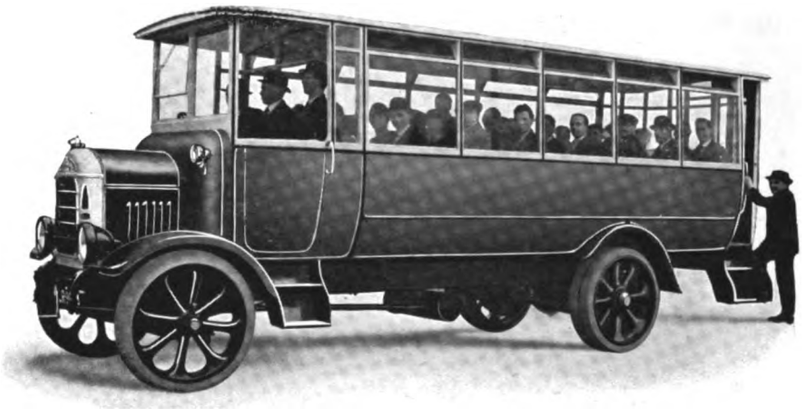

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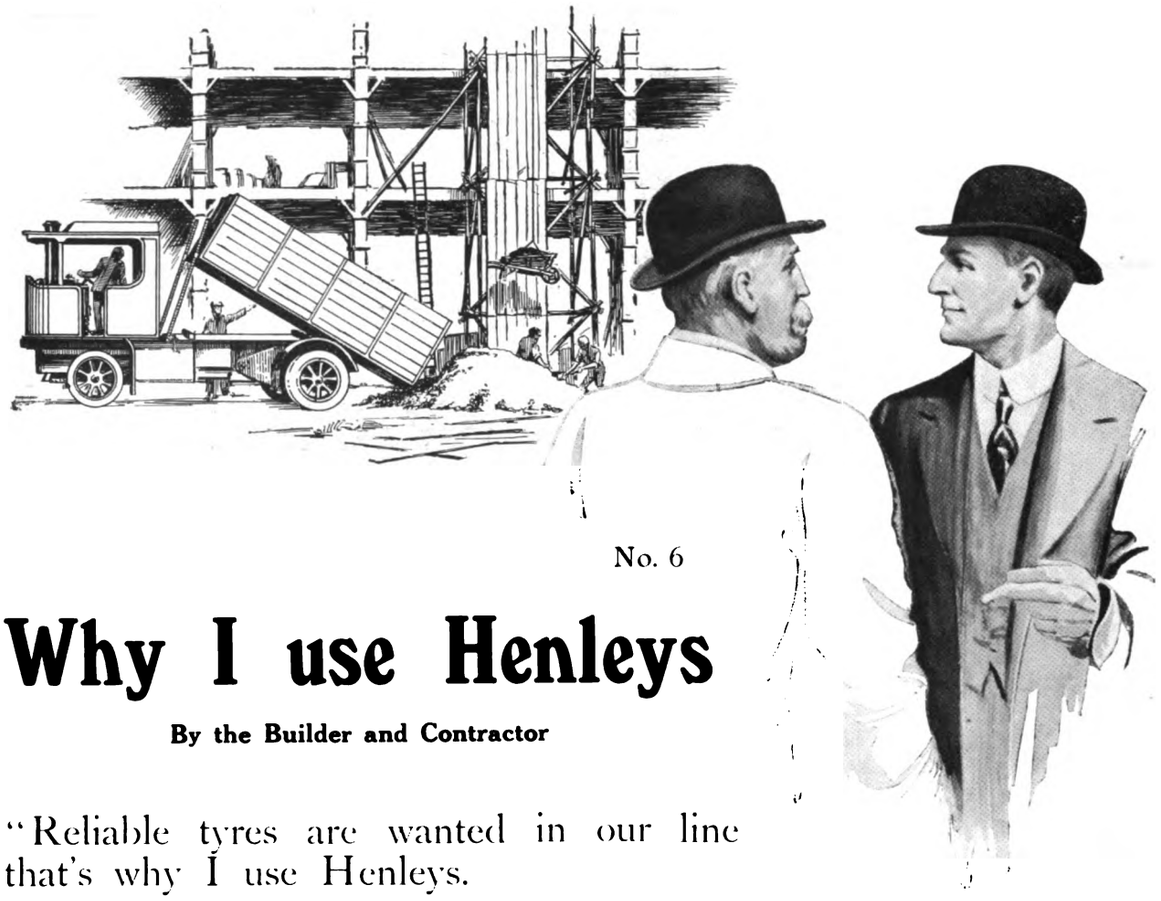

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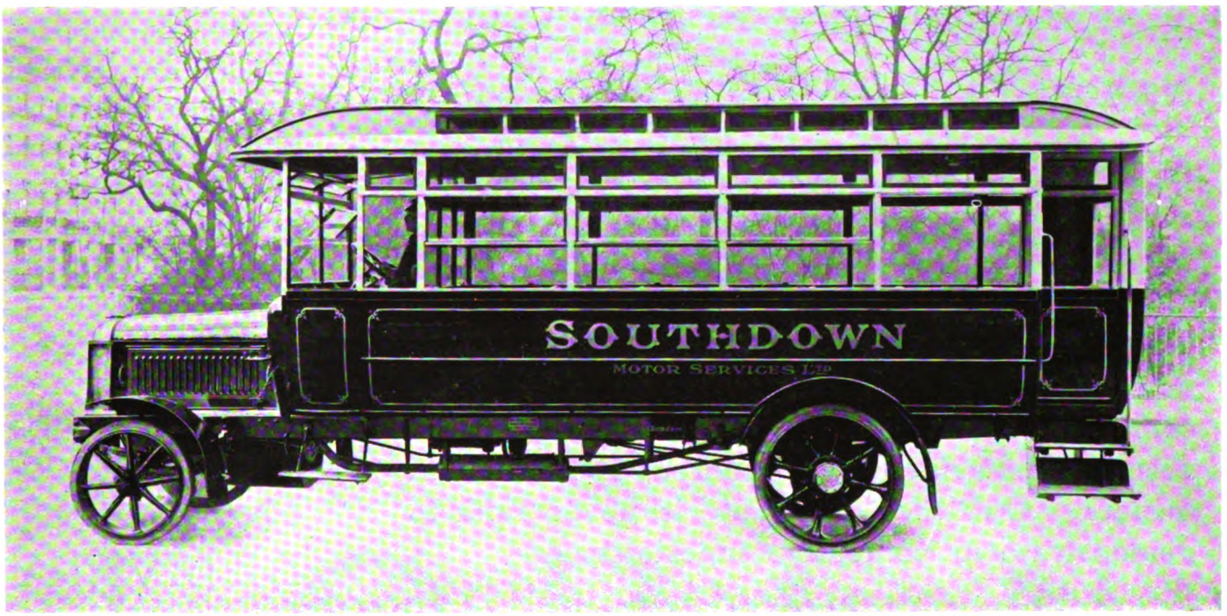

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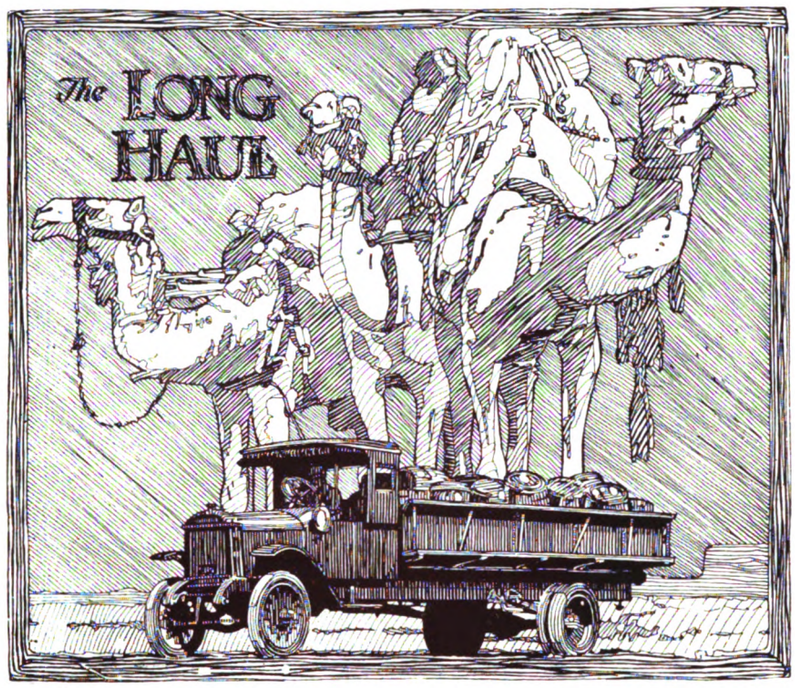

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OLD DRIVER

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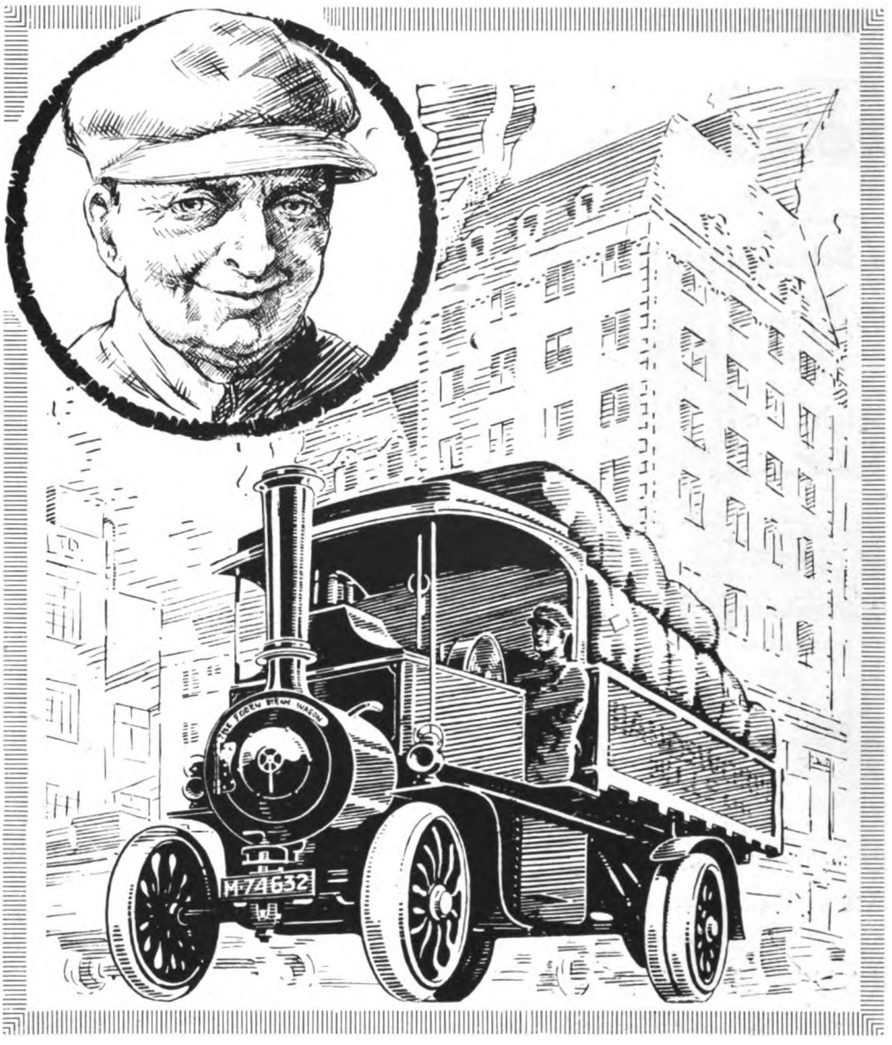

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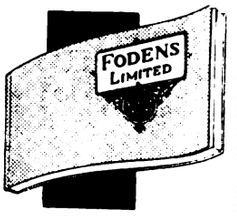
ASK THE DRIVER of a "FODEN" what he thinks of it, he's the man who knows -he lives with it, works with it, and it works with him -that's the great difference.

It never lets him down, it's on time with the goods, every day, in any weather—on any road.

To Business Heads interested in making road transport a big paying success, we shall be pleased to send our catalogue along with full particulars.



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Gives full particulars and testimonials from owners and drivers. It is free to Business Heads.

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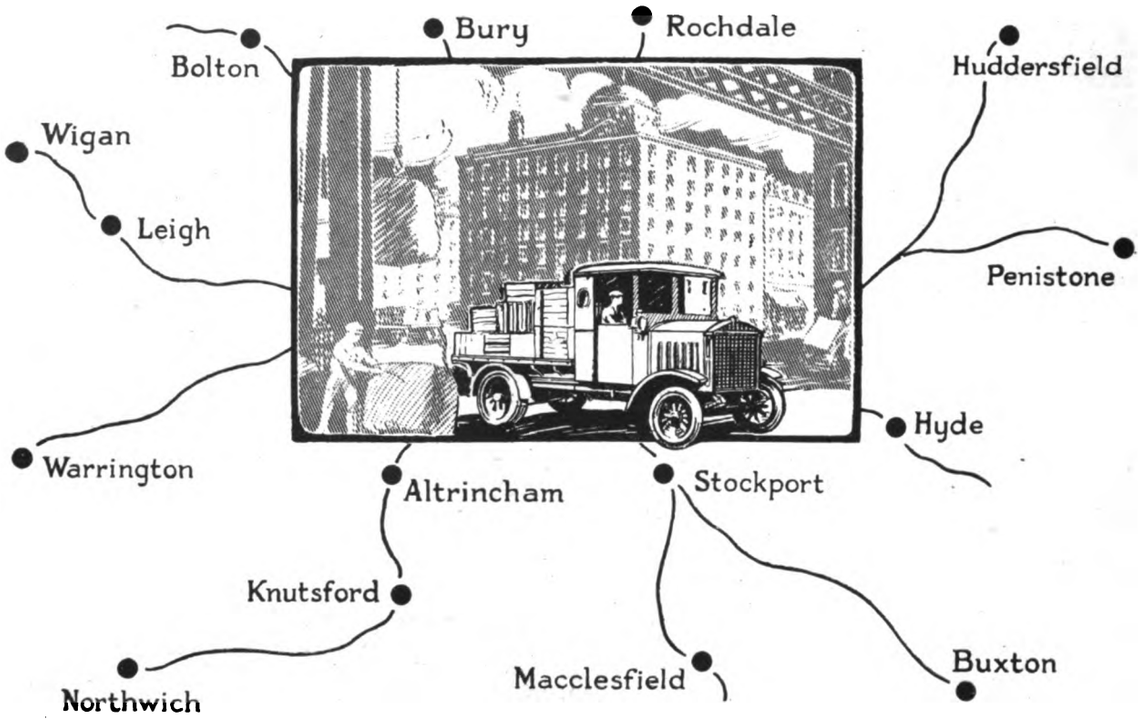

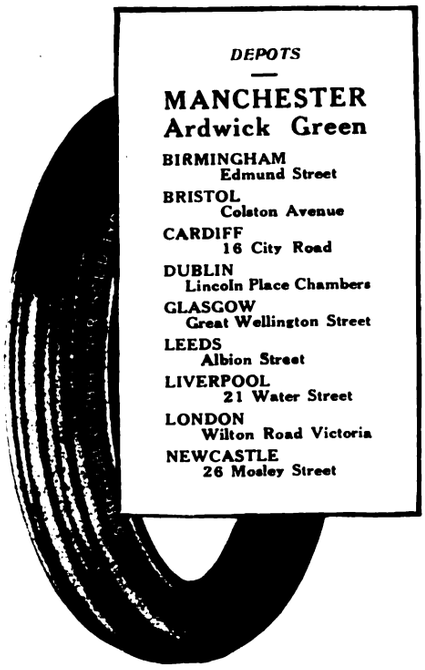

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Tyre Service to be of real help must be on the spot—or near to the spot—in cases of emergency.

We realise this and our depots are thoughtfully distributed throughout the British Isles so as to serve readily all the main centres of industry.

A phrase may mean everything or nothing, but, when we say Manchester Tyres for Manchester Goods, we are citing an example which carries with it a sound suggestion.

Road Transport Managers will find it profitable to use Manchester, *i.e.*, Shrewsbury-Challiner Tyres. They will be assured of a handy service and of a guarantee of 12,000 miles.

For the strenuous traffic conditions of Manchester we offer

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Guaranteed for 12,000 Miles.

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Omnibuses or Charabancs for all passenger-carrying requirements.

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Features of the 6 Cylinder 35 H.P. 3 TONNER HALLEY Commercial Vehicle.

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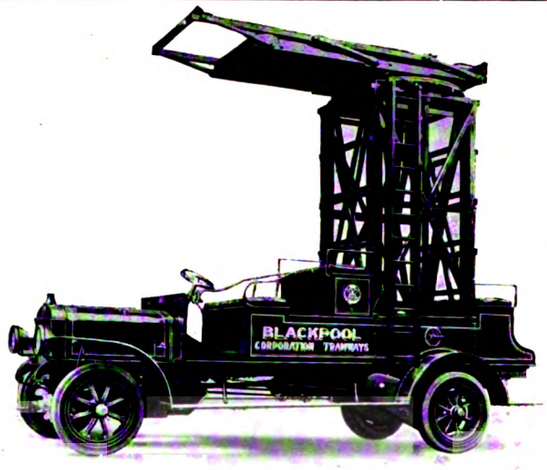

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THE 1920 BURFORD 2-TON LORRY

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¶ During the first four months of 1920 tyres to the value of £1,701,227 were imported into this country *unnecessarily*. British manufacturers can supply all the needs of the home market, and if motorists buy foreign tyres at this rate—600% more than in the corresponding period of last year!—the certain results will be further depreciation of the pound sterling and further increases in the cost of essential foodstuffs and raw materials.

¶ Remember that England is the birthplace of the tyre industry, and that British manufacturers are debarred—either by exchange difficulties or tariff walls—from competing in the very markets from which the bulk of our imported tyres are now coming. Fair play as well as National and personal interests combine to demand your preference for British tyres.

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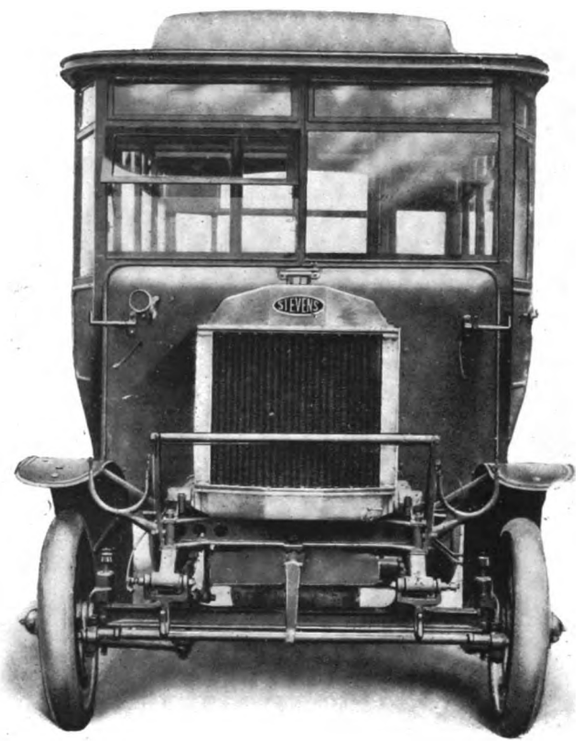

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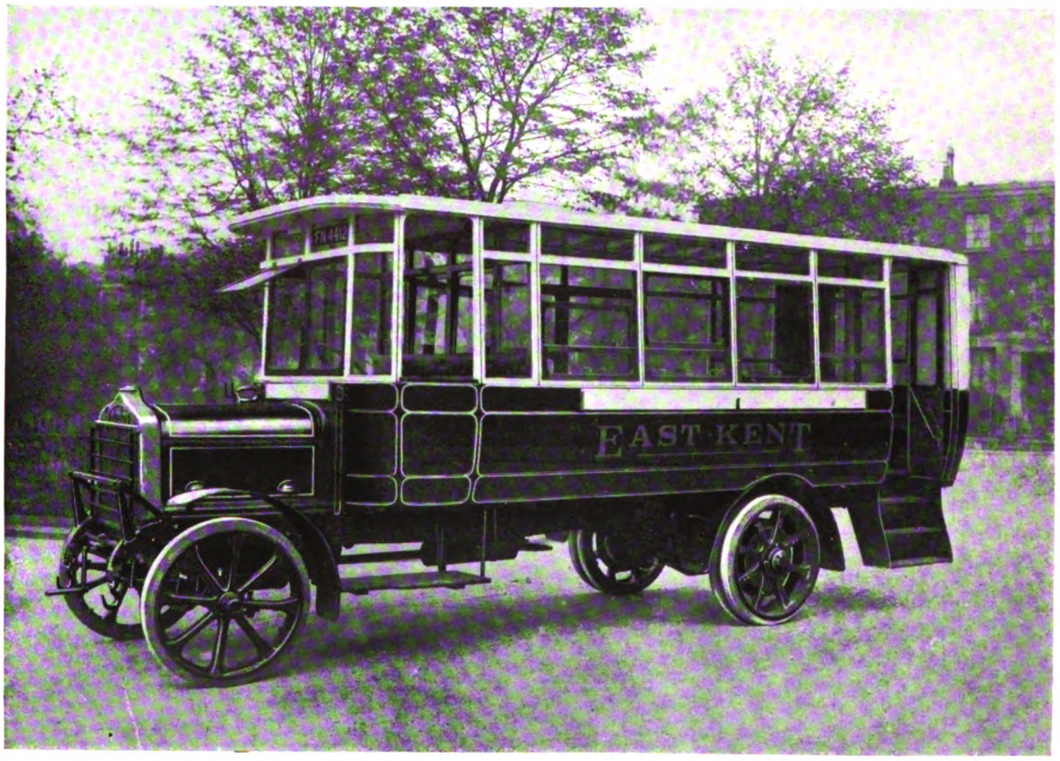

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THE Construction of our Bodies is based upon the experience we have gained as Operators of Public Service Vehicles since 1851. Our experience is at your service. Let us know your requirements.

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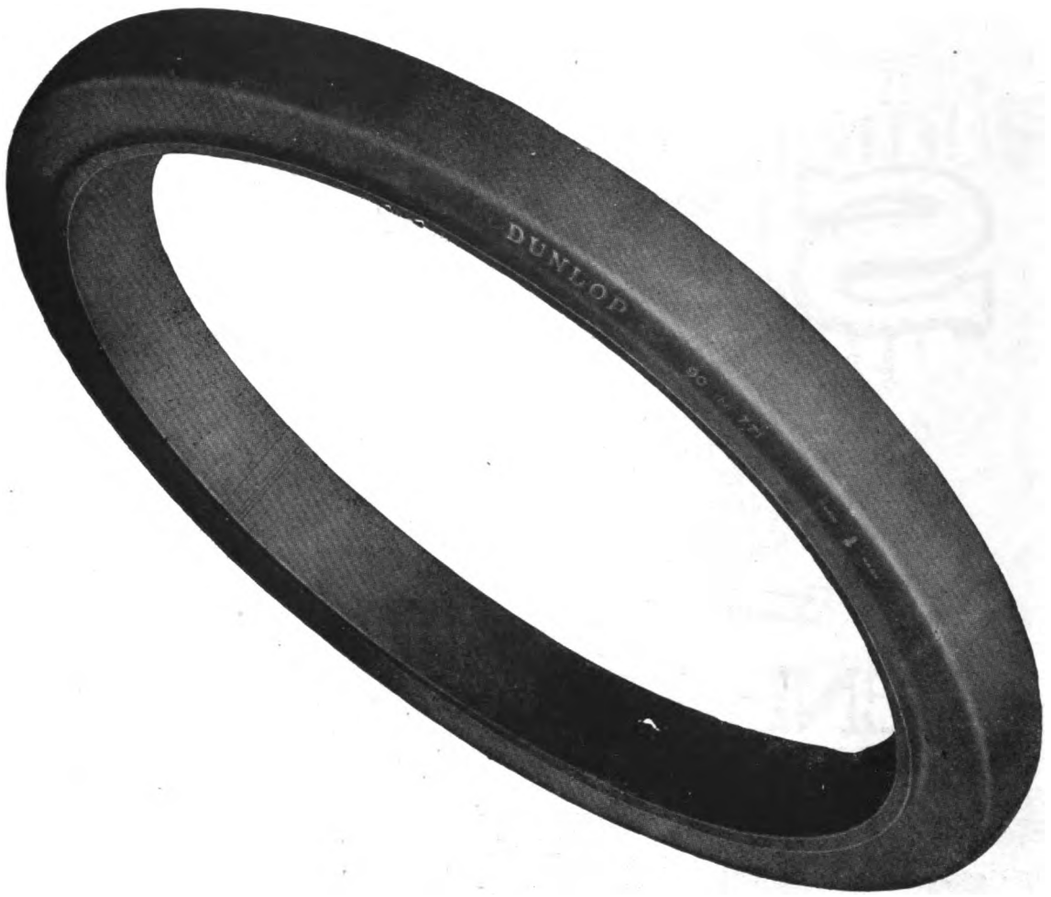

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THE CHOICE OF A SOLID TYRE.

MEN who study costs always choose Dunlop.

As their records *decided*, so do they *justify*, the choice.

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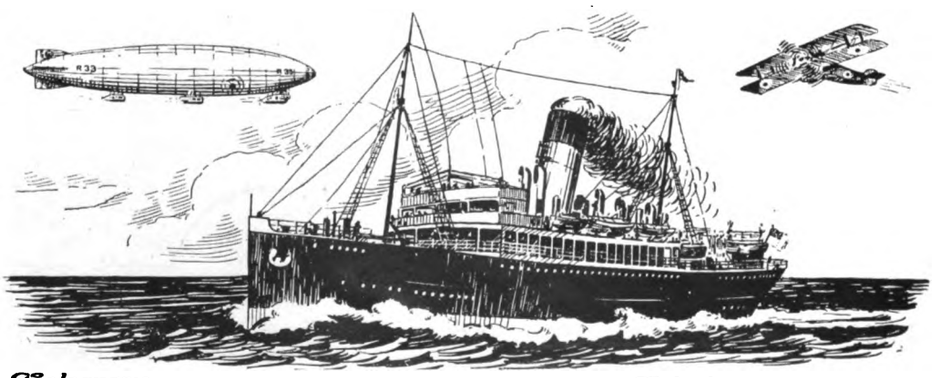

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WITH SUNK TOP DECK
(HICKMAN'S PATENT)

NOW BEING PLACED UPON THE MARKET BY

The GENERAL SEATING COMPANY Ltd

THE SUBSTANTIAL REDUCTION IN HEIGHT
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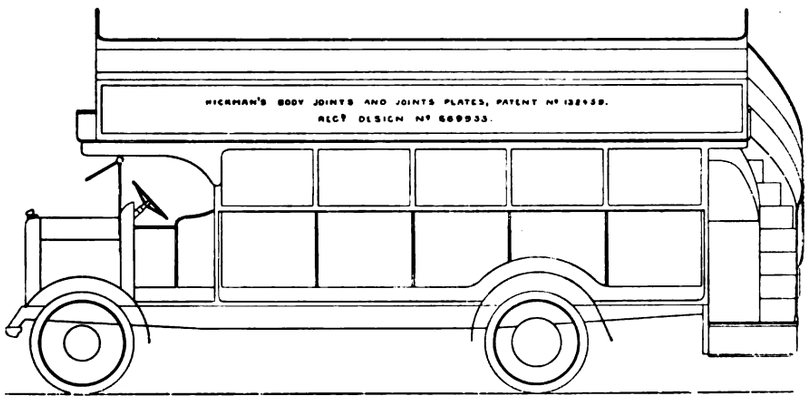
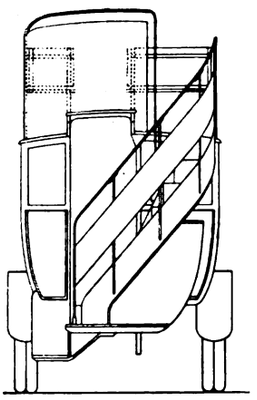
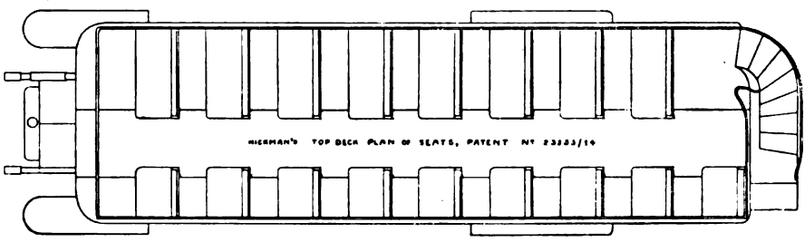
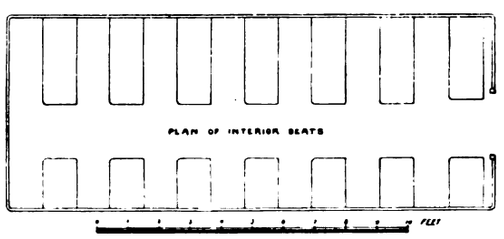
ABSOLUTELY SAFE ON THE WORST POSSIBLE ROADS.

IT TAKES THE PLACE OF SINGLE DECKERS
— AND GIVES DOUBLE THE CAPACITY —









THIS omnibus is eminently suitable for both Town and Country Services.
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The top deck seats are sunk 8 inches below the normal camber of the roof, thus adding considerably to the stability of the vehicle.
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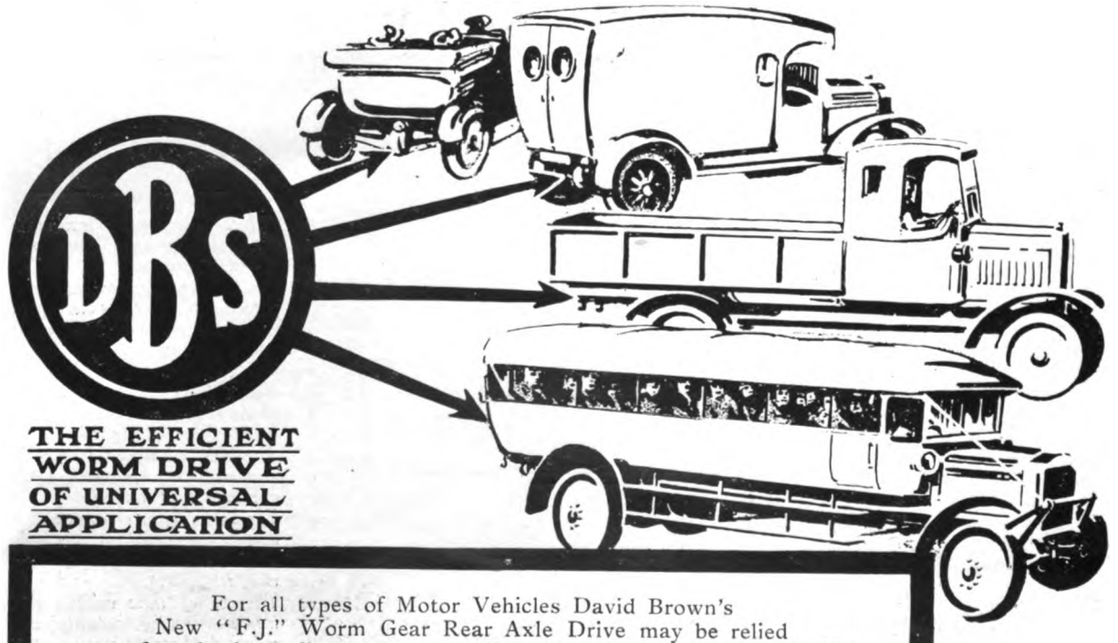

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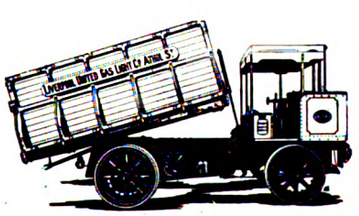

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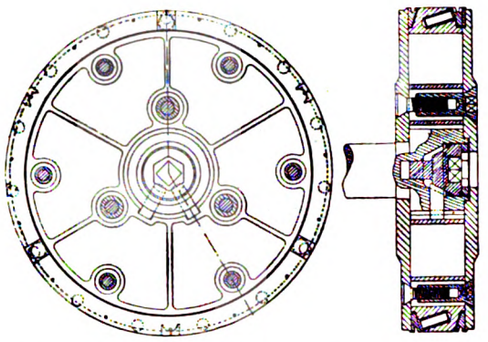

The above illustration is of a built-up type of loco. piston fitted with renewable tread, D-type rings and re-centering device.

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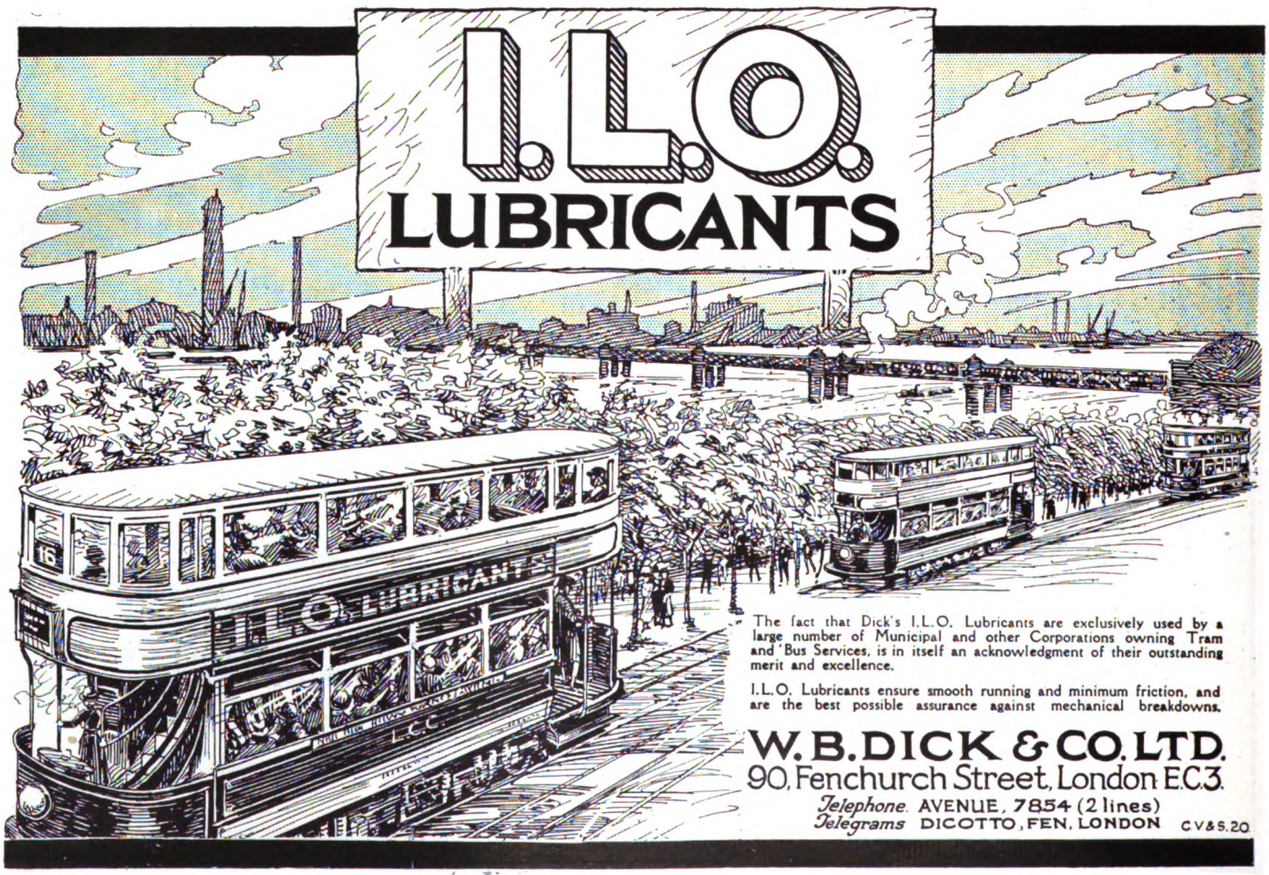

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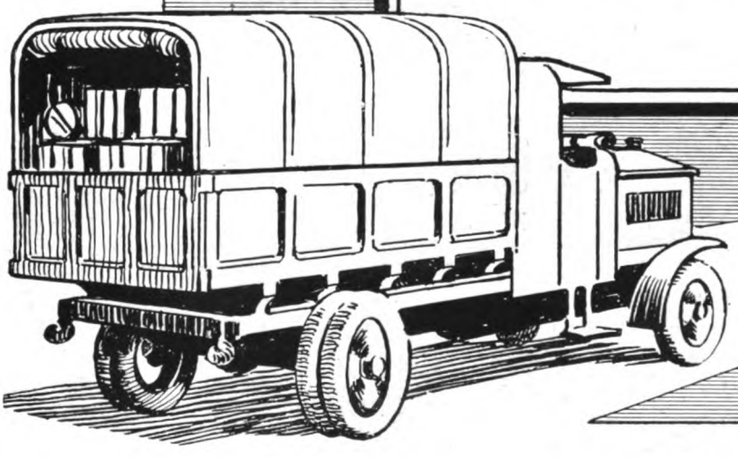

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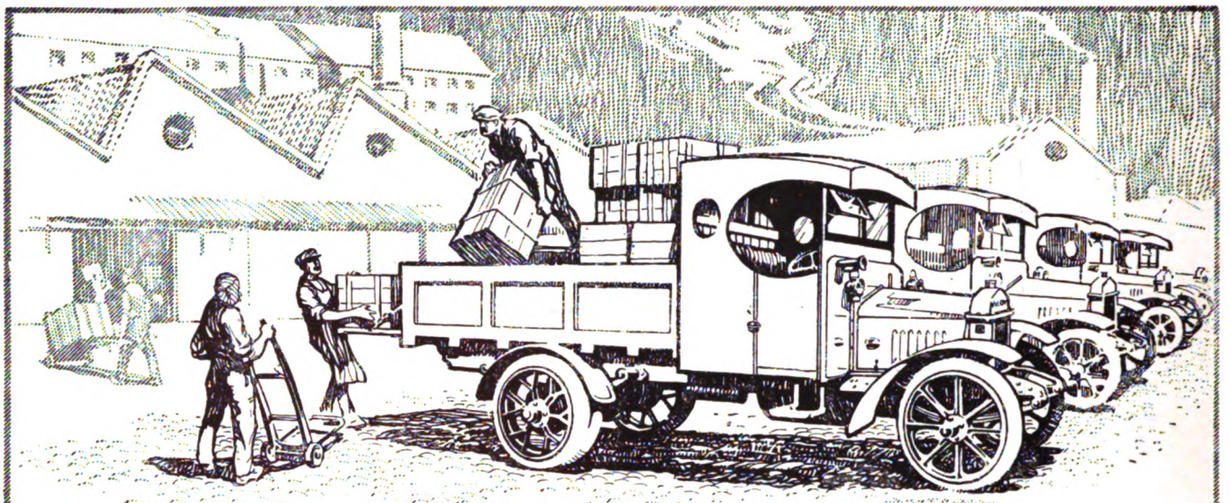

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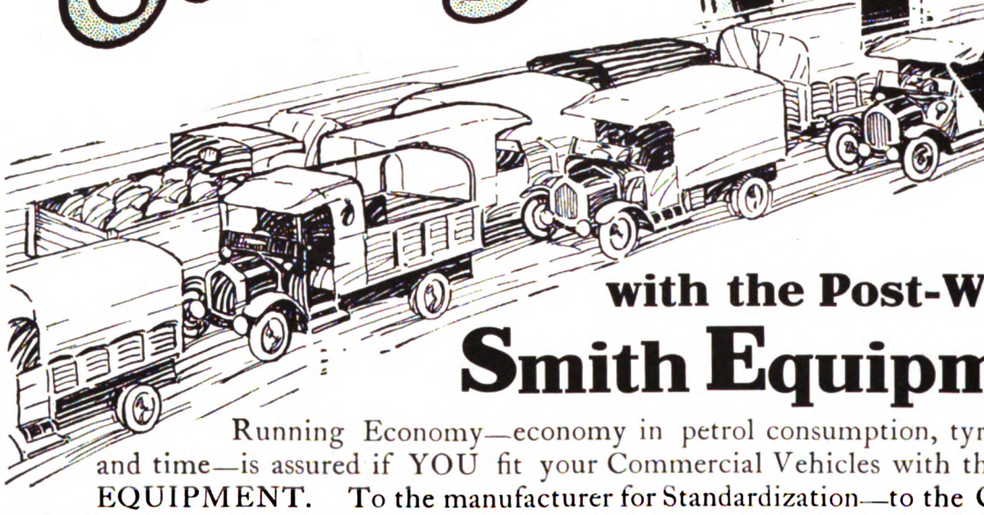

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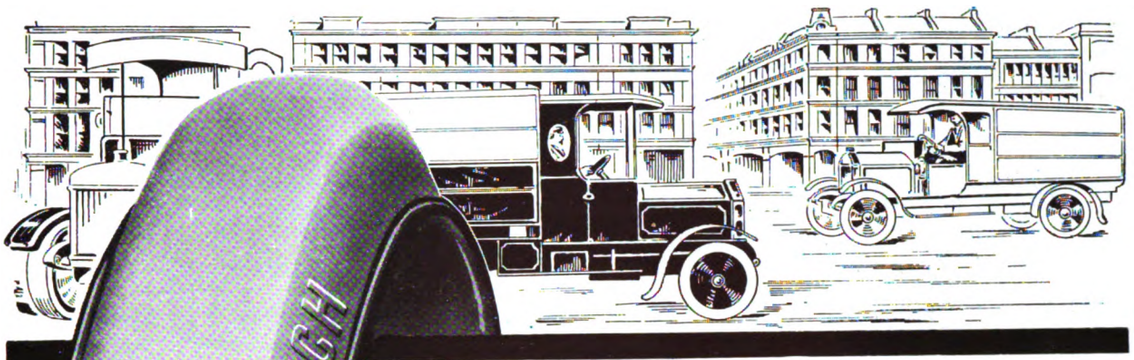

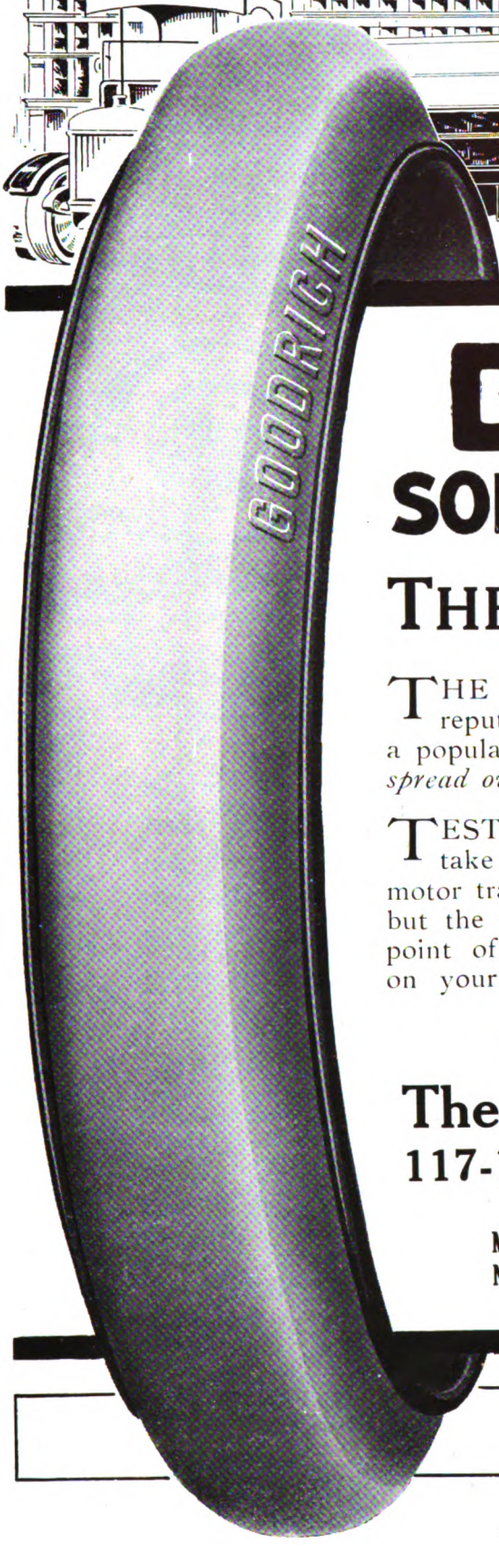

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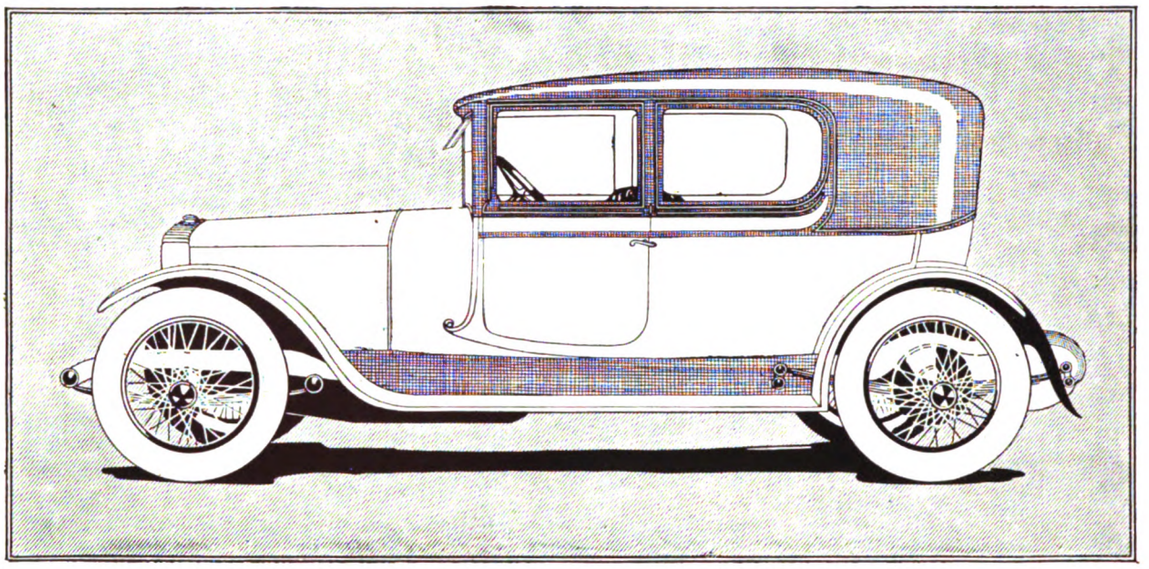

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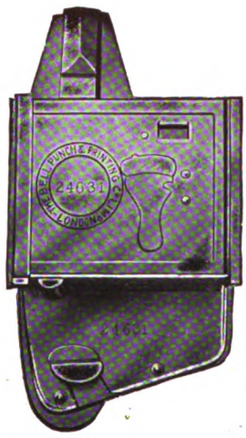

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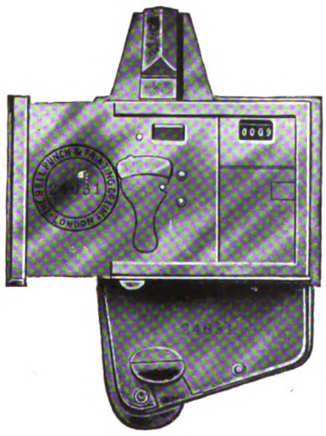

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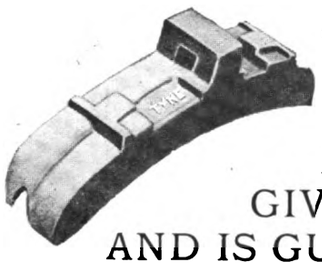

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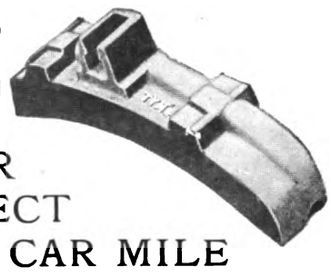

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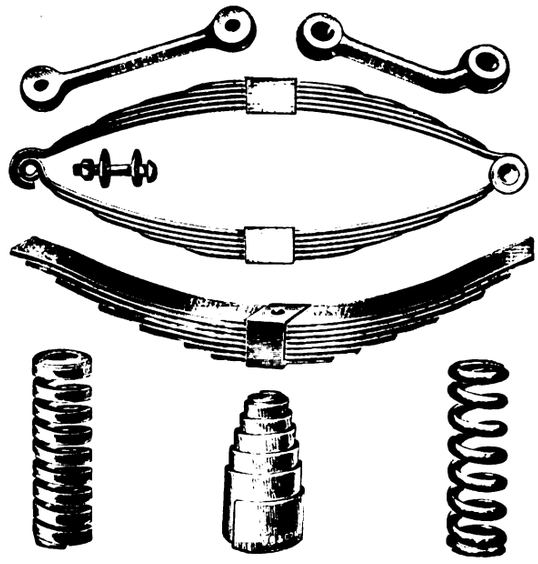

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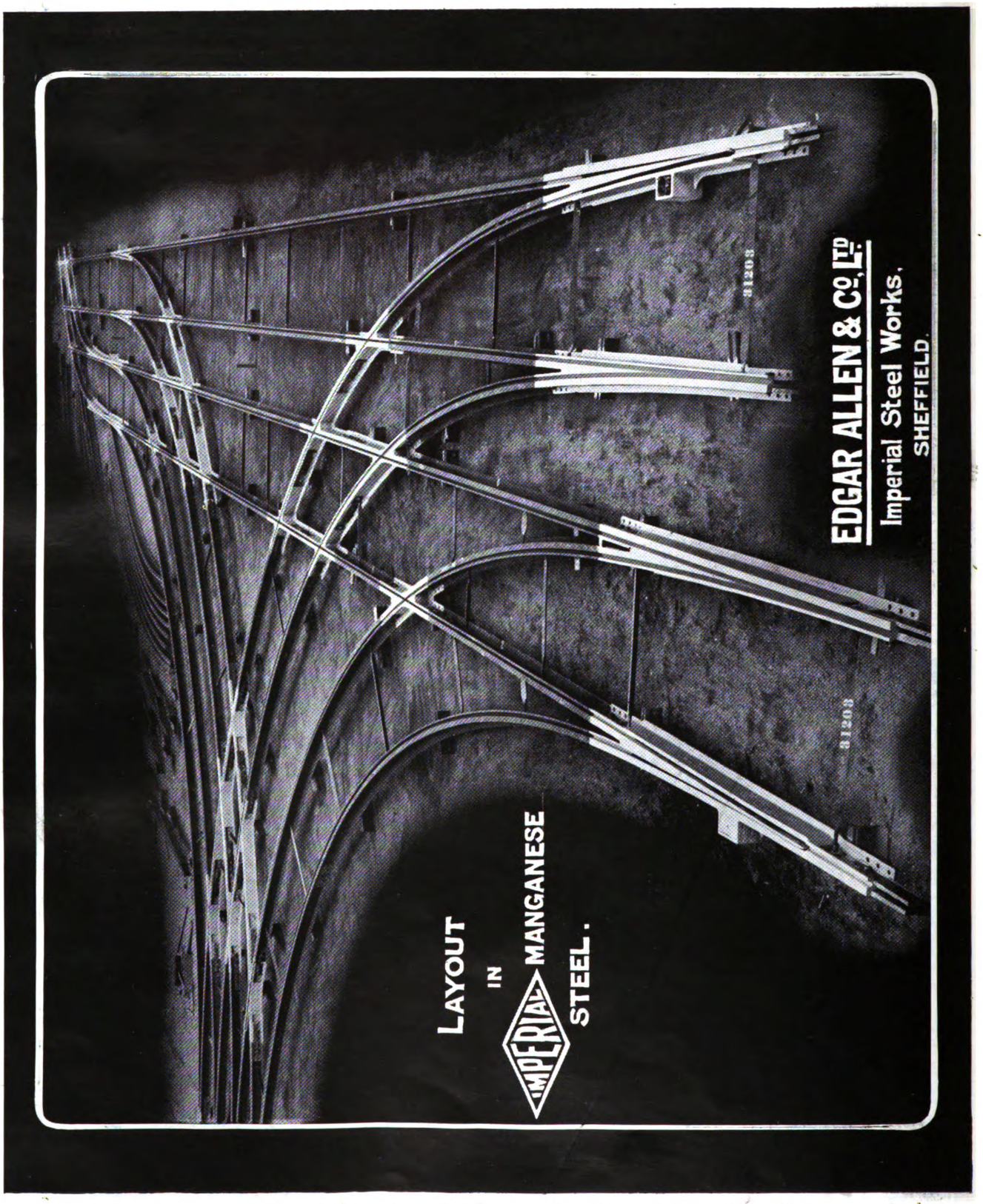

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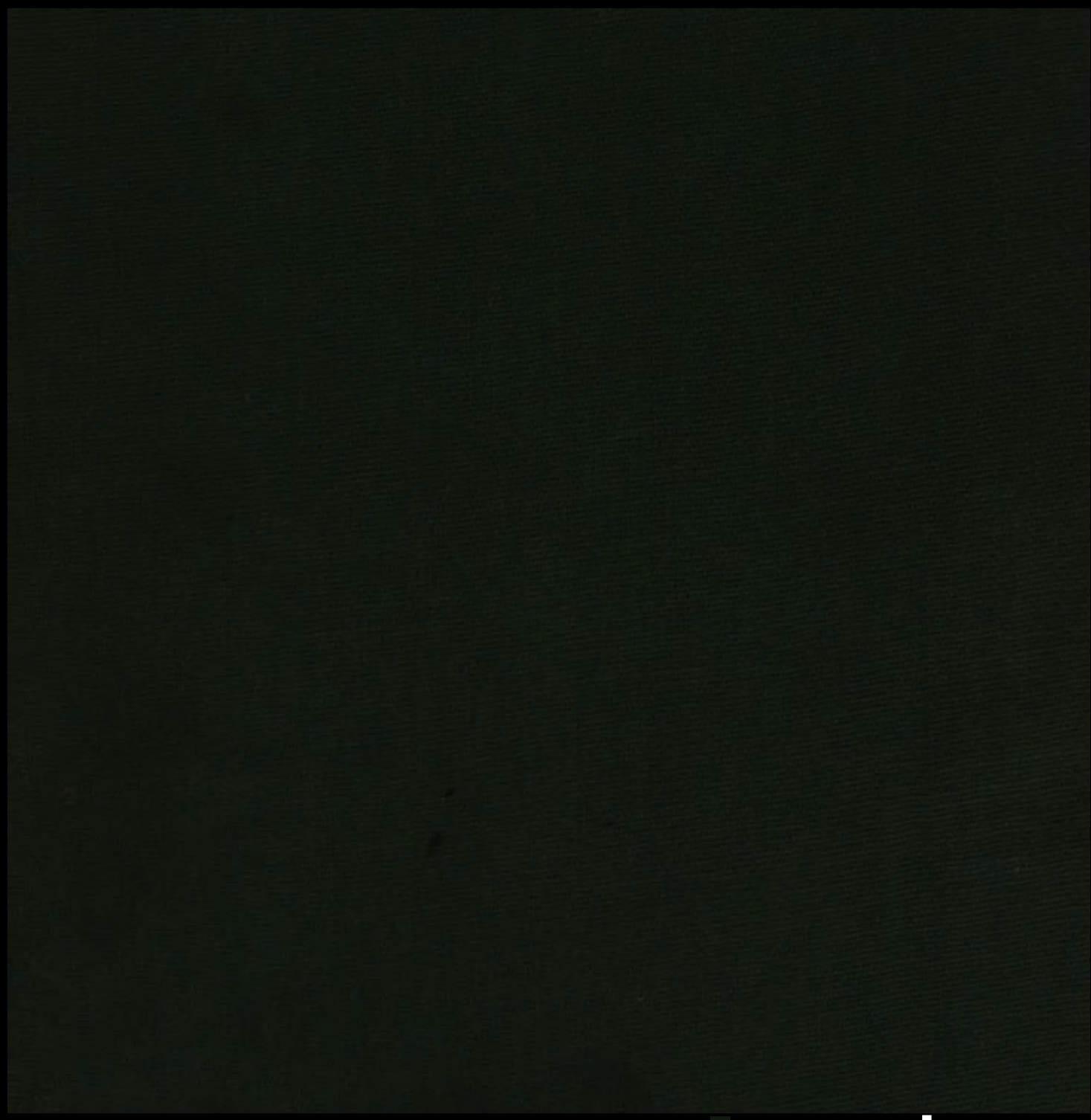
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